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THE SCOTTISH GEOGRAPHICAL MAGAZINE

PUBLISHED BY THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY
PROFESSOR JAMES GEIKIE, LL.D., D.C.L., F.R.S., HON. EDITOR
MARION I. NEWBIGIN, D.Sc., ACTING EDITOR

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CONTENTS.

VOL. XXVII: 1911.

No. I.—JANUARY.

	PAGE
The Vegetation of Maryland,	1
The Geography and Natural Resources of Bolivia,	6
Canal Projects in the Isthmus of Panama and Adjacent Regions. By H. J. Peddie,	13
Geographical Description of the County of Sutherland. By Alice B. Lennie, M.A., B.Sc.,	18
The Mineral Survey of Southern Nigeria. By a Correspondent,	34
Proceedings of the Royal Scottish Geographical Society,	37
Geographical Notes,	37
The Progress of St. Helena—The French Antarctic Expedition—The British Antarctic Expedition—The Distribution of Plants and of Man—The Distribution and Causation of Goitre.	
Educational,	42
New Books,	44
Books received,	55

(*Illustrations.*)

No. II.—FEBRUARY.

A Visit to the Philippines. By Mrs. Gabrielle Vassal,	57
Overland to India,	71
A Visit to Lapland. By A. L. Cross,	78
The Northern Limit of the Olive in the French Alps,	87
Homan's Solar Chronometer,	91
Proceedings of the Royal Scottish Geographical Society,	93

PAGE

Obituary, ... 94

Geographical Notes, ... 94

The Burial of Olympus—Mr. Carruthers' Expedition to North-West Mongolia—The Oasis of Kharga and Climatic Variation—Biological Survey of the Panama Canal Zone—Sir Ernest Shackleton's Plans—Geological Excursion to Spitsbergen—The German Antarctic Expedition—Exploration in Spitsbergen—New Antarctic Expedition—Soda Deposits in East Africa.

Educational, ... 100

New Books, ... 102

Books received, ... 107

New Maps and Atlases, ... 109

(*Illustrations and Figure.*)

No. III.—MARCH.

The Second French Antarctic Expedition. By Dr. J. B. Charcot, . 113

Geographical Description of the County of Sutherland. By Alice B. Lennie, M.A., B.Sc., ... 128

The Prince of Monaco and Oceanographical Research. By William S. Bruce, LL.D., F.R.S.E., ... 142

Proceedings of the Royal Scottish Geographical Society, . . . 146

Geographical Notes, ... 148

Distribution of Forest Trees in the Maritime Alps—Artesian Waters of Argentina—British Columbia—Japanese Antarctic Expedition—Meeting of the British Association—New Classification of Climates—The Sargasso Sea.

Educational, ... 154

New Books, ... 155

Books received, ... 167

(*Sketch-Maps and Illustrations.*)

No. IV.—APRIL.

The Proposed Trans-Persian Railway. By Lieut.-Col. A. C. Yate, . 169

British Work in Spitsbergen: Some Historical Notes. By R. N. Rudmose Brown, D.Sc., ... 180

Geographical Description of the County of Sutherland. By Alice B. Lennie, M.A., B.Sc., ... 188

The Colonisation of Western Canada, ... 196

A New Atlas of Zoogeography, ... 200

Geographical Notes, ... 203

Greek Lands and the Greek People—French Time—Distribution of Agricultural Produce in Argentina—British Expedition to Dutch New Guinea—The Sub-tropical Climate—Forthcoming Congresses.

Educational, ... 208
New Books, ... 209
Books received, ... 223

(*Sketch-Map and Illustrations.*)

No. V.—MAY.

From Hausaland to Egypt. By Dr. Karl W. Kumm, . . . 225
Cotton-growing within the British Empire. By J. Howard Reed, F.R.G.S., Hon. Secretary Manchester Geographical Society, . . . 242
The Valley of the Nile. By Captain H. G. Lyons, D.Sc., F.R.S., . . 257
The Highways and Homes of Japan, ... 260
Proceedings of the Royal Scottish Geographical Society, . . . 263
Erratum. British Work in Spitsbergen, ... 263
Geographical Notes, ... 263
The British Antarctic Expedition—Amundsen's Antarctic Expedition—Dr. Mawson's Antarctic Expedition—Royal Geographical Society's Awards—Tenth International Geographical Congress—Association of American Geographers—New Swiss Tunnel.
Educational, ... 266
New Books, ... 267
Books received, ... 275
New Maps and Atlases, ... 277

(*Sketch-Map and Illustrations.*)

No. VI.—JUNE.

Notes on Changes in the Highland District of Appin on Tayside. By John Stewart, Junior, Tegarmuchd, by Aberfeldy, . . . 281
Ruling Nations: Considerations on their Characters. By Victor Dingelstedt, Corr. Mem., R.S.G.S., ... 291
The Geology of Edinburgh, ... 307
Geographical Notes, ... 310
The Origin of English Highways—Italian Committee for the Investigation of the Sea—The Condition of Southern Italy—The Evolution of the Relief of Central Asia—East Africa Protectorate—Studies of Glaciers in Alaska—Japanese Antarctic Expedition—The German Antarctic Expedition—Wireless Telegraphy Station in Spitsbergen—Drainage Systems and Undrained Areas—Rubber Collection on the Amazon—Railways in Russian Asia.
Educational: The Teaching of Geography, ... 317
New Books, ... 321
Books received, ... 334

No. VII.—JULY.

PAGE

An Expedition to the Snow Mountains of New Guinea. By H. A. Lorentz, LL.D., ... 337

Notes on Changes in the Highland District of Appin on Tayside. By John Stewart, Junior, Tegarmuchd, by Aberfeldy, . . . 359

Eldorado, ... 368

The Vegetation of Africa, ... 375

Geographical Notes, ... 377

Argentine Antarctic Station—Amundsen's Antarctic Expedition—Dr. Mawson's Antarctic Expedition—The Commerce of Japan.

Educational, ... 380

New Books, ... 382

Books received, ... 388

New Maps, ... 390

(Map and Illustrations.

No. VIII.—AUGUST.

The Architecture and Origin of the Alps. By Prof. Jas. Geikie, LL.D., D.C.L., F.R.S., ... 393

Gold and Silver Mining and Reduction Processes as Responses to Geographic Conditions. By George D. Hubbard, Oberlin College, Oberlin, Ohio, U.S.A., ... 417

The Veddas, ... 426

Erratum—Ruling Nations, ... 429

Proceedings of the Royal Scottish Geographical Society, . . . 429

Geographical Notes, ... 430

Distribution of the Vine in France—Isotherms for Africa—The Treelessness of the American Prairies—The Plateaux of Tropical America—Distribution of Land in Arctic Regions—Causes of Formation of Laterite—The Possibility of Climatic Change—The British Association—Zoological Society of Scotland—Hayti and San Domingo.

New Books, ... 438

Books received, ... 447

(Illustrations and Sketch-Map.)

No. IX.—SEPTEMBER.

The Plant-Geography of Ardgoil. By Thomas Nisbet, M.A., . . 449

Density of Population, Scotland, 1911. By Geo. G. Chisholm, M.A., B.Sc., 466

PAGE

Gold and Silver Mining and Reduction Processes as Responses to Geographic Conditions. By George D. Hubbard, Oberlin College, Oberlin, Ohio, U.S.A., ... 470

Denudation and Erosion in the Southern Appalachian Region, . . 474

Knox's Ceylon, ... 479

Geographical Notes, ... 481

The Tree Limit in Sweden—The Coast Erosion Commission—Geophagy in West Africa—Irrigation in Canada—The Altitude of Mount Huascaran—Natural Vegetation and Crop Possibilities in the Great Plains—The German Antarctic Expedition—The Climate of Spitsbergen—An Agassiz Memorial Gold Medal—International Association of Seismology—Modes of Life in Human Geography—The International Review of Hydrobiology and Hydrography—The International Geographical Congress—Trade of Madagascar.

New Books, ... 489

New Maps, ... 502

New Atlas, ... 504

(*Maps and Figures.*)

No. X.—OCTOBER.

The Purpose and Position of Geography. By Colonel C. F. Close, C.M.G., R.E., ... 505

The Meeting of the British Association, ... 516

Life in a French Upland Region, ... 532

Constructive Waterfalls. By Professor J. W. Gregory, F.R.S., D.Sc., University, Glasgow, ... 537

Geographical Notes, ... 546

Establishment of an Aërial Postal Service—Recent Volcanic Eruption in the Philippines—The Galapagos Islands—Expedition to British New Guinea—Personal—Harbour work at Lagos—The Lötschberg Tunnel.

Educational, ... 550

New Books, ... 551

Books received, ... 558

(*Maps and Diagrams.*)

No. XI.—NOVEMBER.

Some Recent Contributions to Geography. By Geo. G. Chisholm, M.A., B.Sc., Lecturer on Geography, Edinburgh University, . . . 561

Notes on the Geography of the Edinburgh District. By James Cossar, M.A., F.R.G.S., ... 574

PAGE

Proceedings of the Royal Scottish Geographical Society, . . . 600

Geographical Notes, ... 601

The Pre-History of Wales—The Galapagos Islands—The Plant Life of Hare Island—Glacial Erosion—The Tenth International Geographical Congress—The African Palm-Oil Industry.

Educational, ... 604

New Books, ... 606

Books received, ... 609

New Maps and Atlases, ... 613

(*Plate, Maps and Illustrations.*)

No. XII.—DECEMBER.

The Norsemen in America. By Dr. Fridtjof Nansen, G.C.V.O., . . 617

The Sculpture of the Goat Fell Mountain Group. By Frederick Mort, M.A., B.Sc., F.G.S., F.R.S.G.S., ... 632

Notes on the Geography of the Edinburgh District. By James Cossar, M.A., F.R.G.S., ... 643

Proceedings of the Royal Scottish Geographical Society, . . . 654

Geographical Notes, ... 659

The Franco-German Congo Agreement—The German Antarctic Expedition—Amundsen's Antarctic Expedition—Eighteenth International Congress of Americanists—The Symons Medal of the Royal Meteorological Society.

Educational, ... 662

New Books, ... 663

Books received, ... 666

Report of Council, ... 668

(*Maps and Illustrations.*)

INDEX. 673

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

THE VEGETATION OF MARYLAND.[1]

(With Illustrations.)

WE have recently received a well-illustrated volume on this subject by Messrs. Shreve, Chrysler, Blodgett and Besley, which gives an instructive account of the plant formations of the State named. A brief summary of the volume may prove of interest to those who have followed here the accounts which have been given of the plant-formations of parts of the British Isles. By the courtesy of the secretary of the Maryland Weather Service, we are able to add some illustrations of the vegetation described.

Maryland, though a small State, displays a great variety of surface, for its axis lies nearly at right angles to the Alleghany Mountains, and the elevation ranges from sea-level to a height of 3342 ft. Its position in latitude causes it to contain representatives both of the northern and the southern floras, for it lies at the junction of the two zones. The rocks range through a great variety of formations, from the oldest to the youngest, yielding a corresponding variety of soils, but there is no glacial drift, as in the States further to the north.

The State as a whole lies in the zone of deciduous forest, and, with the exception of small areas, was clothed in forest up to the time of the advent of Europeans. There is a good rainfall, well distributed throughout the year, though the actual figures vary with the locality.

As to topography, three zones can be recognised:—(1) the coastal plain, containing a good many swamps and marshes; (2) the midland zone, formed by the Piedmont Plateau, and formed of rolling country underlain by old rocks very resistant to weathering; (3) the mountain zone formed by the Alleghany Ridges.

[1] *The Plant-life of Maryland. Maryland Weather Service.* Vol. III. Baltimore: John Hopkins Press, 1910.

A few figures may be quoted to suggest the differences of climate between these three regions. From the tables given in the volume we select the three following stations, as representing the three zones.

Station.	Zone.	Altitude above sea-level.	Mean annual Rainfall.	Mean July Temp.	Mean Jan. Temp.
Sunnyside,	Mountain	2500 ft.	55 in.	68°	26°
Frederick,	Midland	275 ft.	41 in.	77°	31°
Pocomoke City	Coastal	37 ft.	39 in.	78°	38°

Speaking generally it may be said that the three zones named above correspond also to plant zones, for the mountain region, down to an elevation of 1500 feet, is characterised by plants which have a northern

Fig. 1.—Transition from Marsh to River Swamp (Coastal Zone).

aspect. The coastal zone, on the other hand, contains plants of southern type, many of which here find their northern limit. In the intervening or midland zone there occurs a mingling of southern and northern forms.

Of the numerous species confined to the coastal zone we need mention only three. The Bald or Swamp Cypress (*Taxodium distichum*) is a species of southern type which does not extend through the whole of the coastal zone. That very interesting tree known as the Sweet Gum (*Liquidambar styraciflua*), also characteristic of the coastal plain, is one of the species which was driven south during the glacial period, and is now endeavouring to recover its lost territory. Much the same thing

is true of a plant of the heath family called *Clethra alnifolia* which occurs in interglacial beds in Canada, but was driven south by the cold.

It is interesting to note that the Swamp Pine (*Pinus palustris*) is

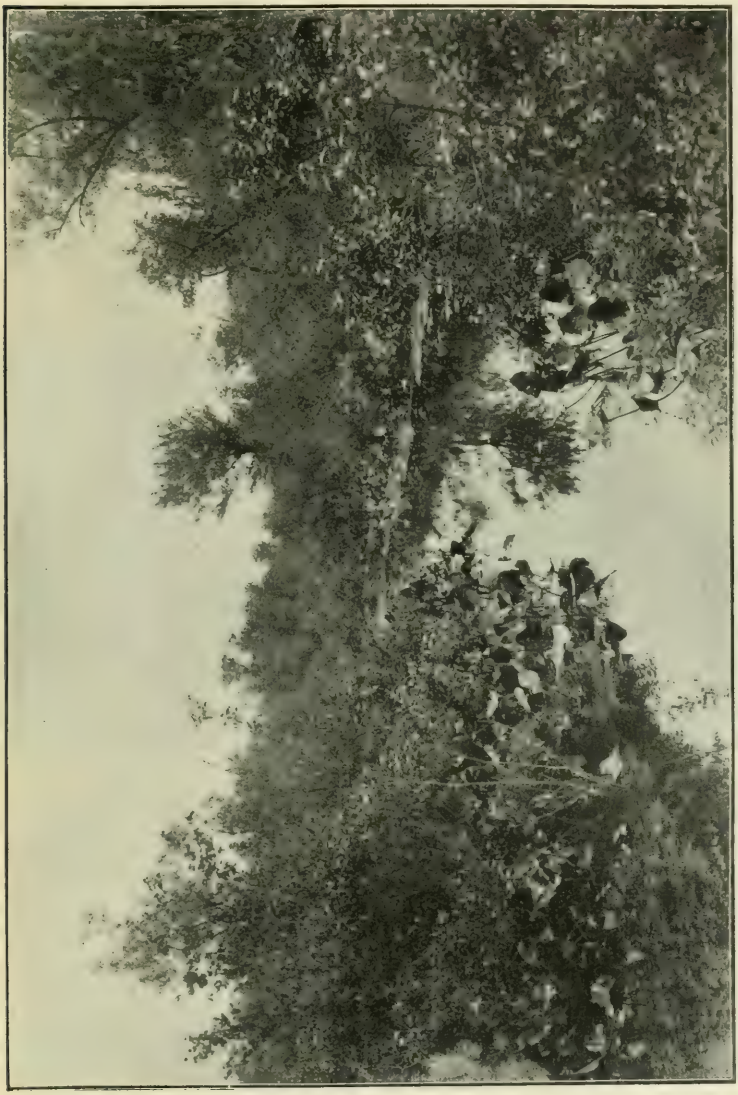

FIG. 2.—Stream Swamp (Coastal Zone).

absent in Maryland, and therefore the Pine Barrens of the States further south are not represented here.

In the mountain zone the most characteristic formation is the Swamp forest, found in narrow valleys with insufficient longitudinal slope to affect ready drainage. The most characteristic plants are such northern

conifers as Black Spruce (*Picea mariana*), and Tamarack (*Larix laricina*) with White Pine (*Pinus strobus*). There is a remarkable absence of the species of Elm, Plane and Maple which occur in similar localities in the other two zones, but oaks and chestnuts are abundant.

Fig. 1 shows a characteristic view of a swampy region in the coastal zone. The photograph is taken at a point showing the transition between a marsh, that is a region without arborescent vegetation, and a river swamp. In these river swamps the characteristic tree is the Cypress (*Taxodium distichum*), shown to the left of the picture. Associated with the Cypress in the swamps are Sweet Gum (*Liquidambar*), species of Nyssa or Black Gum, Magnolia, Green Ash, etc. There is a thick under-

Fig. 3.—A Serpentine Barren.

growth which is rich in species, and there are numerous woody climbers, a southern character, while herbaceous plants are few in number.

Fig. 2 illustrates another type of vegetation found in the coastal zone. This is the stream swamp, which differs from the previous type in the low stature of the trees and the irregular skyline which they present. Here the Swamp Cypress is absent and the trees are deciduous forms, of small and irregular stature, accompanied by numerous shrubs and a rich herbaceous vegetation. The commonest species are the Red Maple, the Winterberry (*Ilex*), and the Green Ash. Owing to the more open character of the wood, the herbaceous plants are of a more sun-loving character than in the river swamp.

The upland (*i.e.* non-swampy) regions of the coastal zone are forest-covered, except where they have been cleared. These forests are of two types, a coniferous type, tending to occur where the conditions are not very favourable and consisting chiefly of Loblolly Pine (*Pinus taeda*) and

Scrub Pine (*Pinus virginiana*), and a deciduous type made up of Oaks, Chestnut and Hickory, with many others. Soil seems to be of especial importance in determining the distribution of the two types, the sandy soils favouring the pines. The predominance of pines here and the

FIG. 4.—Sandstone boulders with polypody and mountain laurel.

occurrence of several broad-leaved evergreens points to a connection with the sub-tropical evergreen forest found to the south of the region.

The midland zone is singularly uniform both as regards topography and vegetation, and is, where not cleared by man, clothed in deciduous forest consisting of Oaks, Chestnuts, Hickories, the Tulip Tree, Beech,

Red Maple, with such conifers as Hemlock (*Tsuga canadensis*), various Pines and Red Cedar (*Juniperus virginiana*) interspersed. In certain regions, however, there occur curious patches (Fig. 3) known as serpentine barrens. These are areas where the underlying rock is serpentine, which weathers rapidly but does not form fertile soil. Here, as the photograph shows, trees are absent, and the scanty xerophilous vegetation consists of small herbaceous plants. In the figure flowering clumps of one of the most interesting of these—Field Chickweed (*Cerastium arvense*)—are to be seen as white patches on the surface of the "barren."

The mountain zone is extensively forested, both coniferous and broad-leaved trees occurring. We have already mentioned some of the characteristic trees. Of the others it is only necessary to say generally that they are of a northern type, the southern species of the lower grounds being here absent. Nevertheless even here *Magnolia acuminata* occurs, the Magnolias being especially characteristic of these North American forests.

Fig. 4 shows a view in the mountain region with numerous sandstone boulders. The point of interest is that the fern growing among these boulders is the common Polypody (*Polypodium vulgare*). The other plant is *Kalmia latifolia*, the so-called Mountain Laurel (really a plant of the heath family). It is curious to find a species which is also British growing side by side with a plant of a genus peculiar to North America, and the association may serve to suggest the combination of resemblances and striking differences which characterise the British (*i.e.* western European) and the North American flora. It may be added that *Linnaea borealis*, so much prized by botanists in Scotland, occurs also, though rarely, in the American forests.

THE GEOGRAPHY AND NATURAL RESOURCES OF BOLIVIA.[1]

Among South American States the Republic of Bolivia ranks next in size to Brazil and Argentina. It has an area of over 1,458,033 square kilometres (911,146 square miles), and is thus three and a half times larger than France.

The mountain system of Bolivia consists of two ranges, the Andes in the west and the Brazilian hills in the east. The highest peaks of the former are covered with eternal snow, and extend over the western portion of the country, their height increasing by degrees until they reach the centre. Towards the east the country gradually becomes flatter, until it finally ends in chains of low-lying hills interspersed with fruitful valleys, which form an agreeable contrast to the barrenness and heat of the plains. Between the Cordillera of the Chilian sea-coast and the true Bolivian Andes lies a vast plateau or tableland known as the Puna, which has an altitude of about 12,465 feet and is about 81 miles

[1] See *Diplomatic and Consular Reports*, No. 4584, Annual Series, "Bolivia."

broad. The principal peaks are Mount Sorata, 21,490 feet high, and the mighty snow-clad Ilimani, which overlooks the town of La Paz. This name "Ilimani" signifies "Eternity." The Puna has little or no vegetation, and the climate is raw and disagreeable, though in the valleys, 2000 feet below, sub-tropical products flourish. There are four other great plains in the tropical regions of the Republic : that of the Eastern Chaco, from the River Pilcomayo to Bahia Negra, a port on the upper reaches of the River Paraguay, and those of Santa Cruz, Mojos and Beni.

The navigable streams of Bolivia cover an area of 5625 miles and flow in the direction of the Atlantic Ocean, being absorbed in the Amazon and La Plata rivers. The confluents of the La Plata system are first, the Taurú, Santa Barbara, San Fernando, Santo Corazon and Cal, which all flow in an easterly direction and form swamps and lakes at Uberaba and Gaiba, thence continuing their course into the River Paraguay. To the south are the Rivers Salado, Galva, Verde, Yavaberi, Fuego, Aguara, Guazu, Confuso, Pilcomayo and Bermejo, the two latter being of considerable size. The Pilcomayo rises near Sucre, the capital of Bolivia, and may one day become an important medium of transport, as much of it is navigable for shallow-draught vessels. The River Bermejo rises south of the town of Tarija, near the Argentine frontier, and is about 744 miles in length, flowing through a populated and cultivated district. The rivers rising in the Eastern and Western Cordillera of Central Bolivia have only short courses, and being partly subterranean do not visibly flow into the sea. The principal waterways of this group are the Desaguadero, with a length of $184\frac{3}{8}$ miles, which is navigable for steamers up to 500 tons, and the River Lauca, which joins the Todos Santos and finally flows into Lake Coipasa. The following rivers flow from Lake Titicaca across the Puna plateau : the Suches, Calvario Aransaya, Cuaca, Tambo, Chunguisa, Rio de las Batallas, Garrapata, Colorado, Tiahuanaco, Guaqui, Hancuyo, with others of minor importance.

Lake Titicaca has an area of 5187 square miles. Its greatest length from north to south is $144\frac{7}{8}$ miles, and its breadth from east to west $69\frac{1}{2}$ miles. It is dotted with small islands, and its average depth is 492 feet, with a temperature of about 48° Fahrenheit, the water being slightly brackish. It is navigated by large steamers which connect the Peruvian and Bolivian railroads to La Paz, as well as by Indians who, in spite of the severity of the storms and the heavy waves which rise, go from one point to another in their frail canoes, built entirely of rushes with sails of the same material. The yearly rainfall in these regions is about 78·74 inches. A number of mineral springs of high temperature with saline and sulphurous waters are found throughout the Republic.

The climatic conditions vary between two extremes, that of extreme cold in the ice-clad regions of the Cordillera, and of heat in the tropical forest zones, where cocoa, coffee and rubber grow abundantly. On the Puna, or high plateau, the crops are barley, potatoes and beans, and in the valleys of the mountains where the climate is sub-tropical the fruit crops are oranges, lemons, custard apples, sugar-cane, peaches, apples, pears and cherries.

The inhabitants of the Republic comprise four principal races—the whites, the Indians, the mestizos or half-castes, and a small percentage of negroes. The total population was estimated in 1905 at 2,088,711, but is probably somewhat higher, as it is known that a large part of the pure Indian inhabitants were not included.

The chief tropical and sub-tropical products of the Republic are rice, alfalfa, yucca, manioc, sugar-cane, coca and cocoa; while fruits are represented by oranges, lemons, granadillas, pomegranates, custard apples, alligator pears, olives, pacai (unknown in Europe), shaddock, figs, bananas and nuts. Various kinds of valuable timber, including the different hard woods and quebracho, are found in the tropical forests.

A distinguished geologist has described the highlands of Bolivia as a table of silver with golden legs, and the simile is an apt one. The country is indeed extraordinarily rich in every kind of metal known. Sulphur, alum, alabaster, antimony, arsenic, asphalt, quicksilver, amethyst, borax, bismuth, copper, cobalt, gold, talc, lapis lazuli, mica, marble, naphtha, opals, rubies, platinum, silver, iron, lead, petroleum, salt, saltpetre, topazes, turquoises and zinc are all present, but the most important is tin.

The gold-bearing regions are (1) The western border of the Republic, extending in an easterly direction towards the watershed of the River Paraguay, and including the departments of La Paz, Cochabamba and Santa Cruz; (2) the region of Atacama, extending through the provinces of Potosi, Mendez, Sinti, Azero and Santa Cruz; (3) the north-east portion of the country near the Peruvian border, on the banks of the Rivers Madre de Dios, Acre and Purus. According to historical statistics, the amount of gold produced between the years 1540 and 1750 amounted to £420,000,000, and from 1750 to the beginning of the twentieth century the province of La Paz alone produced £14,000,000. From the middle of the eighteenth to the twentieth century the products of the mines and gold-washings of the entire country are calculated at £25,000,000. Bolivian mines have hitherto been worked in a most primitive manner, and it is probable that much better results would be obtained by the introduction of more scientific processes.

It does not at present pay to work the silver, as a rule, although this metal is found abundantly nearly everywhere in the country. In former years it was, however, made remunerative, for between the years 1556 and 1651 the Spanish Crown is stated to have obtained the enormous sum of $3,000,000,000 from the workings of the famous "silver hill" at Potosi. There are a large number of abandoned silver mines, which under improved methods and with better facilities for transport could perhaps be made to pay to-day.

The most important article of export from Bolivia is tin. This metal is principally found in the neighbourhood of La Paz and Oruro, in Chorolque, in the south, and in Potosi in the east. Its existence was already known to the Incas, and the mines were worked by them. The export of tin during the first quarters of 1908 and 1909 was £687,200 and £821,985, showing an increase in the latter year of £134,785.

During the first six months of 1909 the export of tin amounted to £1,390,587. The average price in London was £131, 12s. per ton. Of the total export of metals from Bolivia, the United Kingdom buys 40 per cent., Germany and France 25 per cent. each, and other countries the remainder.

Next to tin the most important product of the Republic is rubber, of which about £600,000 worth was exported in 1908. It is found principally in the north-east, near the Peruvian boundary: in the east in the provinces of Santa Cruz and Azero, and in the Acre and Beni territories, the last-named being richest in the product.

The Acre territory is watered by several large rivers having their origin in the Cordillera, and flowing into the Amazon. These rivers are the Beni, Madre de Dios, the Orton and the Acre. The capital is Puerto Acre, which is connected by water with the important Brazilian commercial town of Manaos.

During the rainy season, which lasts from September till May, the rivers are flooded, and the country becomes extremely unhealthy, black-water fever and malaria being prevalent as well as the dreaded beri-beri. This latter disease is of two descriptions. The first description is usually fatal and causes death in a few hours. Having contracted the second description of beri-beri, though temporarily losing the use of his limbs, a patient will recover if removed to another climate in time. It is said that beri-beri will attack mules. A large number of Europeans, Brazilians and Asiatics are resident in the Acre, whose population, exclusive of Indians, amounts to about 25,000.

Two varieties of rubber plant are found in this territory—the caoutchouc, which has to be cut down in order to extract the sap, and the hevea which is merely tapped. In some cases the trees are tapped during a period of two years and are then allowed to rest for a similar period. Other rubber-trees are tapped for six years at a time and then left untouched for a like term. The trees selected for tapping in the Acre are usually from thirty to forty years of age, and are expected to yield for twenty years, after which they become useless.

The department of the Beni is for the greater part flat and is watered by three large rivers, the Beni, the Mamoré and the Itenez or Guapore which is a branch of the latter stream. The left bank of the Beni is covered with thick jungle, but to the east are large plains. The climate is fairly healthy, and only mild cases of fever occur in the swampy low-lying lands. Horses do not thrive, being subject to *mal de cadera*, a disease of the spinal-cord, from which even mules are not immune. A similar disease occurs in India. Rubber is extensively found in this department.

The Pampa lands of the Beni consist of vast stretches of open fertile plains which are almost entirely inhabited by Indians. Maize, tobacco, rice, cotton and yucca thrive well, as do also most tropical fruits. Large herds of wild cattle roam over the plains and afford excellent sport with the rifle, the bulls being extremely savage.

The department of La Paz is the most important in the Republic from a commercial point of view. It has about 450,000 inhabitants, of

whom 15,000 are wild Indians. The remainder consists of whites, cholos or half-castes, and Aymará and Quichua Indians. The climate is cold and raw on the higher altitudes, but 2000 feet down shows a rapidly increasing temperature. On the Puna or highlands the crops are potatoes, beans, barley and wheat. In the valleys sub-tropical fruits are produced. The capital is La Paz, which stands 11,906 feet above sea-level, and is the seat of Government.

Much of the land on the plateau is extremely fertile, being covered with a light coating of nitrate, and would, if irrigated, be capable of producing large quantities of food-stuffs. The only natural fodder found is *Festuca dissitiflora*, and two other varieties of sparsely growing pampa grass which constitute the food of the llama and vicuña. Nearly all the streams flowing down from the mountains contain gold. It is stated that a British company is successfully carrying out dredging operations on one of these rivers. Precious stones are also occasionally found in this department.

The province of the Yungas lies to the east of the Cordillera and consists of fertile valleys which supply La Paz with fruit of all kinds. Maize, rice and coca are also cultivated. The Indians also use a plant of the orchid family as a sustaining food, grinding it into a fine flour. The inhabitants of the Yungas are nearly all pure-blooded Indians, some of whom are in a wild state and hostile to the whites.

The department of Oruro extends over an area of nearly 50,000 square kilometres (31,250 square miles) of treeless tableland, having very sparse vegetation. The average elevation of the department above sea-level is 11,810 feet, the climate being raw and windy and very cold in winter, the average temperature not exceeding 50° Fahrenheit. Owing to lack of irrigation and a thick covering of nitrate, the soil is not very productive. The small crops grown are chiefly potatoes, barley and beans. This department, however, as has already been shown, is extremely rich in minerals of all kinds, and more especially in tin, which is exported in large quantities.

The town of Oruro, the capital of the department, lies at an altitude of 12,116 feet above the sea-level. Its population is 20,000, and being the point of departure of the Antofagasta Railway for the Chilian coast, it is in reality the most important commercial town in the Republic. Its trade is, however, almost entirely in the hands of Germans, Austrians and Italians, there being no British stores in the town.

The chinchilla is found in these regions, and is much sought after on account of the value of its fur. The Bolivian chinchilla is larger and more valuable than the Chilian variety. It is easily crossed with the viscacha, but the fur is then of much less value. Another curious animal bred on these highlands is the alpaca, which yields from 10 to 14 lbs. of beautiful wool. If crossed with the vicuña the wool is even finer.

The famous hill of Potosi, which is of volcanic origin, though honeycombed in all directions, is by no means exhausted of its treasure. A French company are at the present moment considering a project of opening up its base, which as yet has not been exploited.

The crops raised in the department of Potosi are similar to those of the highlands of Oruro, consisting mainly of barley, beans and potatoes. Sheep, goats, llamas and alpacas are bred, and there is a considerable export of chinchilla skins. The wild Chiriguano Indians pay an annual visit to Potosi, bringing in gold dust and skins and feathers for barter. Convention compels them to invest some of their gains in clothing while they remain in the neighbourhood of the town, but this is speedily discarded on their departure.

The town of Sucre, the capital of the Republic, in the department of Chuquisaca, was formerly known as Charcas or La Plata. The neighbourhood is believed to be extremely rich in gold. The town is clean and well built, and lies at an altitude of 9331 feet above sea-level, the climate being one of eternal spring. The population is about 20,000, with about 500 foreigners. There are two breweries, also spirit distilleries, tobacco factories, flour mills, tanneries, soap factories, and a number of German firms and mining industries. Although the seat of Government is now at La Paz, the Supreme Court still sits at Sucre. The greater part of the country is mountainous, but the valleys are fertile, producing barley, wheat, potatoes and rice. Grapes also do well, and wine of a fair quality is produced at Cinti. The minerals are gold, silver, copper and iron. Marble and petroleum also are among the products. It is reported that coal exists. The trade of Sucre is almost entirely in the hands of Germans.

The department of Cochabamba is, on the whole, healthy, though fever is not unknown in some of the valleys. The products are tropical and sub-tropical, and alfalfa is grown to a considerable extent. Horse-breeding is one of the principal industries, some fine animals being raised. About ten miles of the railway in construction to Oruro are already completed. The minerals are gold, silver, copper, lead, tin and iron. Sulphur, lapis lazuli and marble are also obtained. The capital bears the same name as the department. It is a handsome old Spanish town, formerly known as Oropeza, and has a population of 22,000 inhabitants. It lies at an altitude of 9433 feet, under the shadow of Mount Tunari, which, with its elevation of 16,400 feet above sea-level, is one of the loftiest peaks of the Bolivian Andes. The neighbourhood of the town is extremely fertile and adorned with numerous fine old colonial houses standing in beautiful parks and gardens. Alfalfa, barley and wheat are grown extensively, as well as a great many varieties of European fruits—such as plums, cherries and apples, which were introduced by the Jesuits. Many excellent paintings and works of art are to be seen in the churches. No mines are worked at present, but their exploitation will doubtless be facilitated by the railway which is being constructed from Oruro. The region is well watered by the Rivers Arque, Mizque, Secure and Chapare.

The department of Santa Cruz comprises an area of 141,751 square miles, and contains a population of 209,604, according to the official census of 1900. The capital, Santa Cruz de la Sierra, has a population of about 20,000, of whom about 300 are foreigners, Germans predominating. The agricultural produce consists of sugar-cane, coffee,

cocoa, coca, rice, maize, cotton, tobacco, bananas, wild vanilla, pineapples and many other tropical products. At present the markets for this produce are the Beni, Tarija and Sucre. In the province of Vallegrande wheat and European fruits are cultivated. Its forests are of vast extent, and abound in useful and beautiful woods adapted for dyeing, tanning, cabinet-work, building and railway sleepers; among these are mahogany, cedar, rosewood, jacarandá, quebracho, tajebo, curupai (for tanning), palo santo, etc. Rubber is found in the province of Velasco. Sugar and coffee are produced mostly in the vicinity of Santa Cruz. Rubber and hides are exported either viâ Puerto Suarez on the River Paraguay, viâ Cochabamba and the Oruro Antofagasta Railway, or viâ Yacuiba, through the Argentine to Rosario de Santa Fé. The department is extremely rich in minerals, but, owing to the want of capital and of facilities for bringing machinery into the country, this industry has not been developed. There is gold in the alluvial ground near Santa Rosa in Velasco, gold-bearing quartz in the mountains of San Javier in the same province, and in the mountains of San Simon, near the River Itenez, there are some old mines which were worked by the Spaniards. Tin ore is stated to be found in San Javier in the Cordillera, and at Buenavista, about sixty miles north-west of Santa Cruz. At Concepción, in the province of Velasco, copper ore (malachite) has been found, but appears to be of low grade. There are several petroleum springs in the mountains of Buenavista which yield oil sufficiently clear to be burnt unrefined. There are also springs in the province of Cordillera where the oil is darker and contains mineral tar. Salt mines are found in the province of Chiquitos, but they are not worked at present, as this article is imported from San Luis, in the department of Tarija.

The department of Tarija, with its capital of the same name, has about 10,000 inhabitants. It produces some wine of a fair quality, and sheep, cattle and horse breeding is carried on to a considerable extent.

Much of the Bolivian Chaco is low-lying land under water in the rainy season, but the higher parts are thickly populated by a number of Indian tribes who are hostile to strangers. The River Pilcomayo rises near Sucre and flows into the River Paraguay near Asuncion. At about half way in its course navigation is interrupted by the Patiño swamps, where the current becomes very shallow. The lower part is deep enough for large vessels to navigate. The forests contain valuable hard woods, including quebracho, a large quantity of the extract of which is annually exported to Hamburg. In addition, the Chaco contains some of the best grazing land in South America.

Several new railway lines are in course of construction which will greatly facilitate trade. Thus a branch line is being made to connect Potosi with the main Antofagasta and Bolivian Railway; the town of La Paz is being connected directly with the coast by a line to Tacna; another line is to connect Tupiza with the main line, and this will ultimate join with the Argentine system, and afford a direct route to Buenos Ayres.

CANAL PROJECTS IN THE ISTHMUS OF PANAMA AND ADJACENT REGIONS.

By H. J. Peddie.

In view of the interest which the Panama Canal is at present exciting, especially as regards the proposed fortifications, it may be of interest to indicate the different canal projects which have at various dates been advocated, and in some cases promoted. These are fairly numerous, and some are of pretty old standing. Different writers give 1513, 1517, and 1520 as the first date when a canal project to unite the Atlantic and Pacific oceans was made. It is said that there still is, or was, in Nuremberg a terrestrial globe made by John Schöona in 1520, which shows the line of a proposed canal *via* Darien.

However it may be as regards the dates given above, there seems no doubt that in 1550 Antonio Galvao, a Portuguese navigator, published a book to prove that a canal could be cut between the two oceans at Tehuantepec in Mexico, or in Nicaragua, Panama or Darien. The following year Gomora, the Spanish historian, memorialised Philip II. of Spain, urging on the project, but the Spanish Government, who controlled the isthmus, had no desire to make their wealthy dependencies on the Pacific easier of access to their European rivals, and discouraged any such project, and went the length of making it punishable by death to seek to improve even the land communications, or to make known any better route than that from Porto Bello to Panama. Had the unfortunate Darien Scheme in 1698-9 succeeded, possibly a waterway between the two oceans might have been made long ago. The lamentable collapse of that scheme effectively prevented any such project.

It may be suggested that an isthmian canal was beyond the engineering skill of the age, but on the other hand it must be remembered that in those days vessels were comparatively small, and that canal engineering, which had been successfully practised in Egypt, Assyria, and China before the Christian era, and shortly after that date had been introduced into Europe, had by the time of the Darien Scheme made great progress. Leaving aside the vexed question whether lifting locks were invented in the fifteenth century by the celebrated Italian painter and engineer, Leonardo da Vinci, or by the Dutch a century before, we know for certain that they were in common use in the sixteenth century. An age which could produce an engineering triumph such as the famous Languedoc Canal (1666-81), which is 148 miles long, has a summit level of 600 feet above sea-level, has 119 locks, about 50 aqueducts, and a depth of 6½ feet, and is a standing monument to French engineering skill and enterprise, and perhaps as great an engineering triumph of its day as the Suez and Panama canals are of the present day, was quite equal to the task of piercing the narrow neck of land between the Atlantic and Pacific oceans, and providing a waterway sufficient for the vessels of the age.

In 1771 the Spanish Government changed its policy and ordered a

survey for a canal *via* Tehuantepec, which was reported impracticable. In 1779 the Nicaraguan route was surveyed, but owing to European troubles the project came to nothing. In 1808 Alexander Von Humboldt, the famous traveller, pointed out the lines he thought the proposed waterway should follow, but with no practical result.

After the Central Republics achieved their independence in 1823, interest in the project revived, and in 1825 unsuccessful overtures were made to the United States for financial aid to carry out a scheme. In 1830 a concession was granted to a Dutch company to make a canal *via* Nicaragua, and since that date numerous concessions have been made to citizens of the United States, France, and Belgium for interoceanic canals either by the Panama or Nicaraguan routes, but, with the exceptions of the Panama concession of 1878, and the Nicaraguan concession of 1887, no constructional work was undertaken.

In 1849 a railway 47 miles long across the isthmus was surveyed, and was opened in 1855. It is now undergoing considerable alteration in connection with the construction of the Panama Canal. In the following year, that is in 1850, American engineers made a survey for a canal, resulting in recommendations of routes *via* Nicaragua, Panama, San Blas, Caledonia Bay, and Darien or the Atrato, with four variants. In 1870-75 an examination of all these routes was made by the American Government, and all except the two first were rejected, on account of their requiring ship tunnels. The Nicaraguan route was favoured as presenting the fewest difficulties and offering the greatest advantages. In 1876 an association was formed in Paris to make surveys and explorations for a canal, and the following year Lieutenant Wyse led an expedition whose object was to examine the Panama route. The following year the association obtained a concession from Colombia, known as the "Wyse concession," and it was under this concession that the actual construction of the Panama Canal was begun, the Paris Congress, held under Lesseps in 1879, having decided in favour of that route in preference to the other routes proposed. In 1880 a company was floated, and thereafter work was commenced for a sea-level canal. The company collapsed in 1888; but a fresh company formed in 1894 took over the work, and proceeded for some time, constructing the canal as a high-level one, but they failed to bring the work to any practical conclusion, and finally approached President M'Kinley and laid their plans before him. An American commission was appointed in 1899 to investigate the whole question of Isthmian Canals, and after some delay and difficulty, and the revolt of the province of Panama from its allegiance to Colombia, and treaties with Great Britain, Panama, Colombia, and negotiations with the French Company, the United States, in 1904, acquired the canal and the canal zone, and began the work of completing it as a high-level canal in dead earnest.

Some years before this, however, the American Government, which had not looked with favourable eyes on the various European projects for isthmian canals, had issued in 1873 a report regarding the Darien route by the river Atrato, and subsequently, in 1884, negotiated a treaty with Nicaragua for the construction of a ship canal to be jointly owned and

managed by the two States. The treaty was rejected by the American Senate; but in 1886 an association was formed in New York, which obtained a concession from Nicaragua the following year and from Costa Rica in 1888, and made a survey for a canal.

In 1889 "The Maritime Canal Company of Nicaragua" was formed and took over the concessions of the parent association, obtained the sanction of Congress, and at once started operations. Beginning at Greytown, at the mouth of the San Juan river, which discharges into the Caribbean Sea, it built a pier, dredged the harbour, cleared the ground, and built a railway 10 miles in length. Then, having expended $4\frac{1}{2}$ million dollars, it stopped work for want of funds in 1893, and operations have never since been resumed.

In 1906 Dr. D. B. Novoa Zerda of Bogota strenuously advocated the Atrato route with three alternative exits to the Pacific. From what has been said it will at once be seen that interoceanic Isthmian canal projects have been fairly numerous and are of pretty old standing.

Engineering and constructional details of the various projects are rather meagre in some cases, and even reliable authorities differ considerably in regard to various points. The following, however, will, I think, be found substantially correct, having been selected from the best authorities with great care.

Beginning with the most northerly route, that by Tehuantepec, the canal would start from the southern shore of Campeachy Bay, on the Atlantic side, and run in a southerly direction to Tehuantepec Bay on the Pacific. The distance that would require to be traversed is somewhere about 130 miles in a bee line, and apparently would involve a good deal of cutting, tunnelling, and a number of locks, whilst the cost would be very considerable, but I have no details.

Passing south we next come to the projects on the Isthmus proper, on which the first projected canal is that of Nicaragua, which starting from a little north of Greytown on the Caribbean Sea, where a harbour was to be constructed, and keeping well to the north of the San Juan river, was to have a channel cut in a south-westerly direction until it struck the San Juan river at San Carlos, about half way to the lake. The reaches of the San Juan, below San Carlos, are choked with sand and not available for slack water navigation. At San Carlos a large dam was to be constructed which would maintain the river, which from that point up to the lake is clear water, at the level of the lake. The latter varies from 104 to $110\frac{1}{2}$ feet above sea-level. At the dam there were to be one lock with a lift of $36\frac{1}{2}$ feet and four locks each with $18\frac{1}{2}$ feet. From the northern end of the river the route ran in a north-westerly direction through the lake to the mouth of the Las Lagas River near Rivas, thence through the valley of the Las Lagas in a sinuous course across the watershed (which rises 160 feet above sea-level) down the valley of the Rio Grande to Brito, on the Pacific coast. The total length would be 187 miles, made up by 100 miles from Greytown to the lake, 70 miles across the lake, and 17 miles from the lake to the Pacific. The necessary time for construction was estimated at ten years, and the cost at 200,540,000 dollars.

We next come to the Panama Canal, but as this has already been described in the *Magazine* for August 1910, and as Dr. Vaughan-Cornish lectured upon it before the Society in March last, it is only necessary to say that the total length will be rather over fifty miles from deep water at one end to deep water on the other end, and from shore to shore about 41 miles. The depth of the canal will be over 40 feet, and it will easily pass the largest battleships and liners. The summit level will be 85 feet above mean sea-level, reached on the Atlantic side by three locks at Gatun, and on the Pacific side by one lock at Pedro Miguel and two locks at Milaflores. The greatest oscillation of the tide on the Pacific side is 23 feet as against only $1\frac{1}{2}$ feet on the Atlantic side. The cost, exclusive of entrance protective works at Colon and fortifications, is estimated at £75,000,000 sterling, but it is quite recognised that it may yet amount to £100,000,000 or even £120,000,000 sterling. Whether lock gates of the gigantic size necessary for the lifts presently designed will be found practicable remains to be seen. It may yet be found necessary to increase the number of lifts. In order to prevent accidents at the locks, it is proposed to tow vessels into and through them by means of electric locomotives, steamers not being permitted to use their propellers. It is a curious fact that the "western" terminus of the canal on the Pacific ocean is actually 22 miles further east than the "eastern" terminus at Colon on the Atlantic ocean.

One of the great objections to the tide-level scheme was the excessive expense of the necessary works to lead off the great floods during rainy seasons. If, however, it ever became either necessary or desirable to revert to the tide-level scheme, such extra works might be so constructed as to answer for power purposes, from which a considerable revenue might be obtained, which would go far to pay interest on the extra expense thus incurred, whilst the possession of great water power in proximity to the canal route would prove of the utmost value to the district from a manufacturing and commercial standpoint.

There seems no reason to doubt that the canal will be completed in January 1915. On the 1st of June last there were close upon 37,000 men at work on the canal and the deviation of the railway, besides nearly 100 steam shovels, some of which each do the work of 600 men.

We next come to the San Blas route. This is the shortest route of all, being only thirty miles long. It has no locks, but would require a tunnel seven miles long, and there is a bad harbour at the Pacific end. It is, however, a route which may yet prove a serious and perhaps successful rival to the Panama route, and seems to me to be the best route for an alternative canal.

I have no particulars as to the route by Caledonia Bay, which is somewhat south-east of San Blas, and much about the same length, and would also require a tunnel and probably heavy cuttings. This is the last of the Isthmian projects.

The Darien Scheme surveyed by the American Government, about which the Secretary of the American Navy issued a report in 1873, was to follow the Atrato for 100 miles, the river being said to be navigable for that distance by the largest steamers, thence a canal 28 miles long would

lead to the Pacific. Twenty-two miles of this canal would pass through a plain having a gradual rise of 90 feet. There were to be three miles of open cutting and three miles of tunnelling. The estimated cost ran from rather under £10,500,000 sterling to rather over £12,500,000 sterling. The tunnel was to be 112 feet high, 60 feet wide, with 87 feet clear headway above surface of water. The canal was to be 25 feet deep, 70 feet wide at top, and 50 feet at bottom. There were to be twenty locks each with a lift of 10 feet. The water supply was to be drawn from the Napipe river. There were two alternative plans with fewer locks and more tunnelling, at an extra cost of several millions sterling. The length of this route and the alleged difficulty in navigating the Atrato in time of high flood, caused its rejection at the Paris Congress in 1879.

The Atrato river, which figures in all Colombian projects, rises in the Colombian Western Cordilleras, about 30 miles from the Pacific, at an altitude of 10,650 feet above sea-level, and, flowing for some hundreds of miles almost due north, with an average fall of 3 inches to the mile, it enters the Gulf of Uraba or Darien by nine mouths badly intercepted by bars. Its width varies, being in some parts from 750 feet to 1000 feet, and its depth also varies from 8 feet to 70 feet. For a considerable part of its course it is navigable for steamers, the distance varying according to the draught of the vessels. It is said to roll down a good deal of gold. Dr. Novoa Zerda's projects utilised this river. In one scheme he proposed to utilise the river for 75 miles, then to use the Truando river, which flows into it, for 36 miles including a short tunnel, then to make a canal 13 miles in length, a ship tunnel 2 miles long, and finally another canal 8 miles long to the Pacific, making a total length of 134 miles in all. The estimated cost was over 103½ million dollars. Alternative plans were first to utilise the Atrato to a latitude as far south as Capica Bay on the Pacific, then turning west and piercing the divide by a canal with a ship tunnel to the Pacific coast; second, to utilise the Atrato up to the divide between it and the San Juan river, which flows due south and then turns west and discharges into the Pacific. The divide between the two rivers is neither very high nor wide, and required a ship tunnel to unite the two rivers. No scale is given on the map accompanying the description, but judging from the map, the Atrato-Capica route is from 30 to 40 miles longer, and the Atrato-San Juan route three times longer than the Atrato-Truando route.

Finally a plan surveyed by the United States Government in 1871 was to connect the Atrato by means of a canal 48 miles long, which apparently necessitated tunnelling, with the river Jurador which discharges into the Pacific north of Humboldt Bay. This project was rejected by the 1879 Paris Congress.

It is very evident that ship tunnels are destined to play an important part in the future in connection with inland artificial waterways. Barge canal tunnels have for long been in successful operation, and engineers are now planning ship tunnels. Both the projected Mid Scotland Ship Canal and the suggested Tyne and Solway Ship Canals have plans for such tunnels, and the Black Sea Baltic Ship Canal is to have such a tunnel.

What effect the attitude of the Japanese Government towards the proposed fortification of the Panama Canal, and the presaged formation of the South American Alliance between Argentine, Brazil, and Chilé (the A.B.C. Alliance, as it has already been designated), will have, remains to be seen. This Alliance, if finally consummated, will almost certainly prove the primary step towards the formation of the long-talked-of "United States of South America," embracing all the States on that continent. It will be of the utmost consequence for "the A.B.C. Alliance" to have easy and direct deep-water communication between its eastern and western members, and if Colombo could be induced to join the alliance, such a waterway might be easily obtained by one or other of the Colombian projects which have just been described. The financial status of the alliance would be so strong that no difficulty would be experienced in obtaining the necessary financial support.

GEOGRAPHICAL DESCRIPTION OF THE COUNTY OF SUTHERLAND.[1]

By Alice B. Lennie, M.A., B.Sc.

(*With Illustrations.*)

Introduction.

Few counties in Scotland appeal to a greater variety of interests than the county of Sutherland. Its very remoteness and isolation have preserved much of value, and add to its attractions in many ways.

The scenery is varied and offers a wide choice to the artist or tourist. The south-east coast, with its farms and villages, its links and woods, and tree-lined roads, may be matched in many southern counties: but in striking contrast to it are the great inland moors, stretching in monotonous undulations, desolate and uninhabited, to the distant rim of mountains. From these wind-swept uplands the rivers have carved out sheltered straths which are dotted with farms and crofts, through which the river winds between meadow and cultivated haughland, with fringes of birch on the steeper slopes. Still other types are found in the west. The limestone districts are the most extensive in Scotland. The passing traveller, though he may be ignorant of the cause, has no difficulty in distinguishing them: the close green turf and the brilliance of the flowers are a striking feature after miles of peat moor or bare rock. The underground rivers, caves, and crystal springs, are equally characteristic and well worthy of investigation. Extending from north to south of the county, is a wild and rugged belt of mountains with

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[1] This essay was awarded the Silver Medal offered by the Society for competition in the class of Geography at Edinburgh University in 1910. The essay has been revised by the author, and a few only of the illustrations which accompanied it are here reproduced.

bare rocky crests and lofty precipices, which would be impassable but that it is cleft by deep glens. Westwards of this barrier tower those strange mountains whose dark red cliffs, rising tier upon tier from a sea of bare grey ridges, overwhelm the beholder by their sheer massiveness and isolation. The western plateau on which they stand is a barren rocky waste, yet it has endless variety in its minor features. It is deeply trenched by narrow ravines, studded with lochs of every size and form, and strewn with boulders, many poised on the very summits of the ridges.

Geologically, this district has an added interest as the oldest known formation of the earth's surface. In places the overlying rocks have been removed, revealing the hills and valleys of that ancient land formed countless ages ago. But of still more absorbing interest is the now classic region of the western mountains. Its structure for long baffled the leading geologists, and formed the subject of the famous Highland controversy. The discovery of its secret has disclosed stupendous movements of the strata of a kind undreamt of before, but now detected in many other parts of the world. Under tremendous pressure from the east, huge beds of rock hundreds of feet thick have snapped across and been piled up one over the other, under whole mountain masses which were pushed bodily forward over them for many miles.

To the sportsman Sutherland has many attractions to offer. Her rivers and lochs are unsurpassed for angling, and abundant game is to be found on all the moors, while a large proportion of the county is given up to that noblest of our sports, deerstalking.

Sutherland is full of antiquarian interest. It contains more numerous remains of ancient buildings than perhaps any other county. These range from the great chambered cairns of neolithic age through brochs and vitrified forts to castles and keeps of the early historic period.

To those interested in agrarian questions, the extensive experiments in the distribution of the population in Sutherland are instructive. Nearly the whole interior of the county was cleared of its inhabitants. Numbers were settled on the coasts, but many emigrated. Though the economic results cannot be regarded as altogether unsuccessful, it may be questioned whether the end aimed at might not have been attained in some less drastic manner.

Size and Boundaries.

Sutherland is situated in the north of Scotland between 58° 38′ and 57° 52′ north latitude, and 3° 36′ and 5° 24′ west longitude. The total area of the county is 1,359,846 acres, or 2124 square miles, of which 1,297,849 acres are land, 47,632 acres water, 12,812 acres foreshore, and 1553 acres tidal water. On three sides it is bounded by the sea, — on the north and west by the Atlantic and the Minch, and on the south-east by the Moray Firth. The shores of the latter are low. The beach is covered with sand or shingle and flat reefs of rock, and is bordered by sand-dunes and links. Beyond Helmsdale the hills approach the coast, till, at the boundary with

Caithness, the cliffs of the Ord descend sheer into deep water. At places the sea is encroaching on the land. At Golspie, which is situated so close to the sea that the back gardens open on to the beach, rows of stakes have been driven in to hold the shingle. During an exceptionally low tide, remains of a forest were discovered in the bay, which may point to long continued subsidence, but are more probably remains of interglacial age. The coastline is regular, the only inlets being Loch Fleet and the Dornoch Firth. Though navigation in these is confined to intricate channels by extensive sand-banks, and further impeded by bars at their mouths, they are yet very important in a coast otherwise devoid of natural harbours.

In the north and west we find a deeply indented, wild, and rock-bound coast with some of the finest cliffs in Britain. Perhaps the grandest are those east of Cape Wrath, Clo Mor, 625 feet in height, rising farther east to over 900 feet. At Whitten Head they are equally high, and in many other places range from 200 to 400 feet. In most cases the line of precipices is irregular, carved, and fretted by the ceaseless Atlantic surges into boldly jutting headlands and picturesque stacks, and pierced by caverns, natural arches, and deep narrow gullies or goës, as they are called. In a storm the booming of the waves in a cave of the island of Bulgach is heard far out at sea. Only two lighthouses guard these dangerous shores, one at Cape Wrath, the other on the western side of Stoer peninsula.

The whole north coast is bold and rocky, with several small islands close off shore, including the island of Roan, the only island of Sutherland which is still inhabited. The cliffs are broken only at the long inlets of Loch Eriboll and the Kyles of Tongue and Durness, and by shallow sandy bays at the mouths of the rivers. The finest stretches of sand are at Torrisdale Bay, at the mouth of the Naver, over a mile in length, and at Balnakill Bay at Durness. In almost every case the sand has been drifted into dunes by the strong north winds and heaped up against the cliffs, sometimes to a great height. At Balnakill Bay the huge dunes extend right across the limestone peninsula of Fairaird Head, covering the cliffs on the other side. In Sango Bay, Durness, the sand has been blown up the cliffs to about eighty feet in height, and has invaded the public road.

The west coast is extremely rugged, but south of Loch Inchard the cliffs are not so continuous. The deep bays are themselves broken by smaller inlets and coves, and are studded with islands, of which the two largest, Oldany and Handa, were till recently inhabited. The latter is famous for its stupendous cliffs of red sandstone, almost exactly 400 feet in height at their culminating point, though formerly thought to be much higher. Owing to their nearly horizontal bedding and vertical fissures, they look like gigantic walls of masonry, yet afford shelter to myriads of sea birds which crowd their narrow ledges during the nesting season.

The boundary between Sutherland and Caithness is formed by the eastern watershed of the Halladale and Helmsdale river basins, about thirty miles from point to point. That this is a natural division is

proved by the fact that, though there is a good road from north to south parallel to the boundary, the only ones which pass from one county to the other are the main north and east coast roads, and of these, the latter

FIG. 1.—Cape Wrath.

[*Photo by R. Lunn.*

crosses the Ord of Caithness at a height of 726 feet. It is unfenced, and the ground slopes more or less steeply seaward. One can readily imagine how dangerous it is in the height of a winter storm, but direct evidence is not lacking. An inscription within a few yards of the boundary

indicates the place where a traveller lost his life in a snowstorm some few years ago. The railway has been forced to turn inland for twenty-five miles. It ascends Strath Helmsdale to Forsinard, on the desolate moors at the head of Strath Halladale, before it turns eastwards to Caithness, which it enters at an altitude of 708 feet. North of this the hills on the boundary are only 600 to 800 feet in height, but immediately to the south is a range of hills which rise steeply from the strath to peaks of 1000 to 1800 feet. The highest peaks are Scalabsdale, 1819 feet, Cnoc an Eireannaich, 1698 feet, and there are ten others over 1000 feet.

The southern boundary, on the other hand, is largely defined by rivers—the Dornoch Firth and Kyle of Sutherland, which together form the estuary of the Oykell, the river Oykell itself to its source in the southern spurs of Ben More, thence southwards to the Cromalt Hills, and along that ridge to Loch Veyatie, and so by Loch Fionn and the river Kirkaig to the sea. Though the Oykell forms an admirable boundary in its lower reaches, it is not so satisfactory towards its source. It rises ten miles north of the Cromalt Hills, and flows in a general south-south-east direction, thus excluding from Sutherland a long wedge-shaped piece of country, ten miles long and six miles wide at the base. On the other hand, it must be remembered that it is a region of mountain and moorland. The only part of the boundary at all populous is the lower part of Strath Oykell, where the river is broad and deep. It is tidal as far as Rosehall, to which boats of thirty tons can ascend. In former times the Firth and the Okyell proved formidable barriers to communication between Sutherland and the south. Up to 1811 the only means of crossing was by ferry. The Meikle Ferry near the mouth of the estuary and on the direct route to the north was the most important, and still exists for the occasional travellers who venture that way. In 1809 it was the scene of a terrible calamity, when nearly a hundred persons were drowned. On the construction of the road from Inverness to the north in 1811, a bridge was built by Telford over the Kyle at Bonar, but, as it added nearly twenty miles to the journey from Tain to Dornoch, the ferry continued to be subsidised by the post office till 1868. The railway crosses the Kyle near Invershin. There is no other bridge between Bonar and Oykell Bridge, 18½ miles farther up. At this point the road to the west crosses the river and so leaves Sutherland. It ascends the southern side of the valley to the moors above, and cuts across the projecting portion of Ross to Loch Borolan, where it enters Sutherland again near Altnacealgach Hotel and continues by Loch Assynt to Lochinver. About a mile beyond Altnacealgach the road for the south branches off, and from Lochinver another, but inferior, road goes south by Inverkirkaig.

Scenery and Geological Structure.

Sutherland is essentially a country of mountain and elevated moorland. The average elevation is about 1000 feet. Low ground is to be found only in narrow strips and patches along the coasts and straths, and is broadest and most continuous in the south-east, but even there

does not exceed two miles in width. The highest mountain masses are in the west and north-west, whence there extends a series of isolated mountains parallel to the north coast but some ten miles inland, and another less crowded belt to the south-east. Only three mountains rise above 3000 feet, and these are widely separated: in the west, Ben More and its twin summit Conaveall, 3275 and 3254 feet respectively; in the north, Ben Hope, 3040 feet; and almost in the very centre of the county, Ben Klibreck, 3154 feet.

The following table sums up the geological formations of Sutherland:

Table of Geological Formations in Sutherland.

Post-Tertiary	Alluvium	Blown Sand Peat Raised Beaches
	Jurassic	Oolites — Upper, Middle, Lower Lias
Palæozoic	Old Red Sandstone	Upper Lower
	Cambrian	Durness Limestone Serpulite Grit Fucoid Beds Quartzite
	Torridonian	Upper Lower
Metamorphic	Dalradian	Gneissose and schistose rocks Hornblende schist, etc.
	Lewisian Gneiss	
Igneous	Granite Felsite, Quartz Porphyry.	

Both in scenery and structure Sutherland is divided into two clearly marked regions by the ridge of mountains which extend from Loch Eriboll to Ben More, along the thrust belt where Cambrian, Torridonian, and Archæan rocks are repeated, inverted, and altered in a most bewildering manner. The western undisturbed region is a plateau of gneiss overlaid by much denuded outliers of Torridonian and Cambrian rocks, which form striking and characteristic mountains. To the east are the schists which cover nearly three-fourths of the county, extending from the out-crop of the great Moine thrust plane, right across the county and under the marginal belt of Old Red Sandstone hills, till truncated by a powerful fault which has let down a narrow strip of Jurassic strata along the coast.

The impression one gathers after extensive touring through the centre and west of the county is of a land bleak and inhospitable in the extreme; but whatever basis of truth this may afford for the generally preconceived idea of such northern lands, in most cases the stranger approaching by rail is none the less surprised to find his first experience of Sutherland differing so totally from his expectations. The view across the Dornoch Firth reveals a well-cultivated and extensively wooded country, rising inland in gently swelling hills; and after crossing the Oykell into Sutherland, the railway ascends the lovely wooded gorge of the river Shin, but the trees obstruct the view, so that the traveller

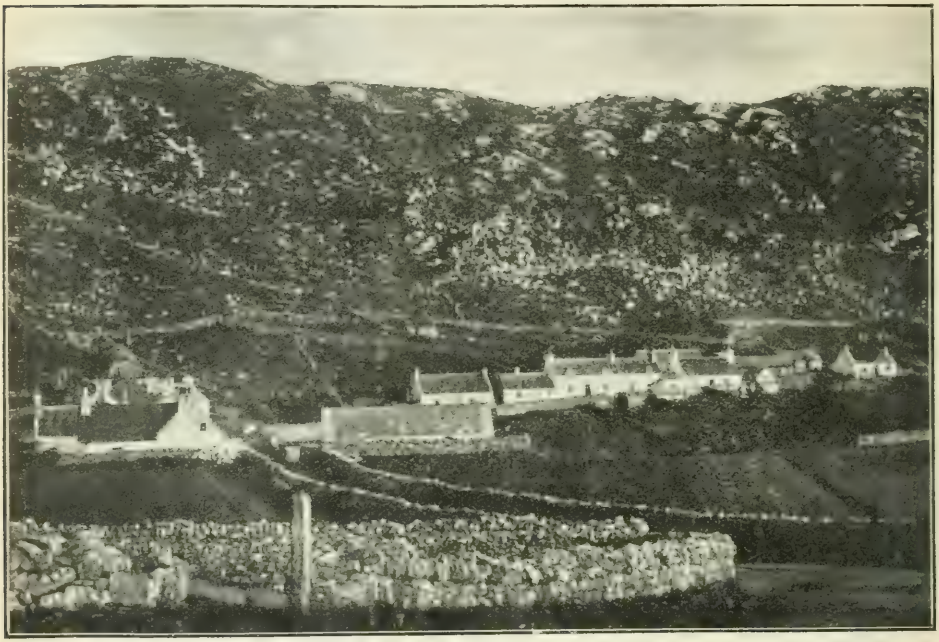

FIG. 2.—Scourie, a village in a typical gneiss region.

obtains only occasional glimpses of the river foaming in its rocky bed far beneath. The descent to the coast again is through a wilder and more open glen, destitute of trees yet not lacking in cultivation and with numerous well-built cottages. Near the coast plantations are again met with, and, together with the well-kept farms, continue to be an important element of the scenery whether the traveller turns south to Dornoch or goes on to Golspie or Brora.

This favoured region however is of limited extent, being confined to the low-lying coastal belt by a line of steep hills. It consists to a great extent of the flat terraces of old raised beaches, with a border of links of varying width along the present shore. These in turn are usually edged with sand dunes. In some parts of the coast, particularly north and

south of the Little Ferry, as the narrow entrance to Loch Fleet is called, the sand has been blown inland and covers considerable areas. The larger dunes are from twenty to fifty feet high. In the south they are partially covered with grass, but north of the ferry have been largely planted with fir.

The Jurassic strata which form a large part of this low ground from Golspie to the Ord consist of sandstones and shales with thin beds of limestone and coal. The former has been burnt for local use, but occurs in small seams which were soon exhausted. The coal is of estuarine origin, irregular in thickness, and in places more resembling lignite. It is worked at Brora, where the main seam is from three to nearly five feet in thickness, but contains a layer of iron pyrites which detracts very greatly from its value, both from the sulphurous fumes it gives off in burning, and from the danger of storing it on account of its liability to take fire when wet. The overlying Middle Oolite contains some fine building stone, extensively quarried near Brora. It is white and very durable, easily worked when first quarried but hardening rapidly on exposure. It was used for the magnificent extensions to Dunrobin Castle at the beginning of last century, and for the statue of the first Duke of Sutherland which crowns Beinn a Bhragie. It is of more than local importance, having been employed in the construction of London Bridge.

Behind the cultivated area from Strath Fleet to the Ord of Caithness there stretches a continuous belt of hills broken only by the straths of the Brora and Helmsdale, but deeply trenched by the smaller streams. North of Loth the hills are of granite, but to the south they are formed by a much eroded belt of Old Red Sandstone about five miles wide. These rocks consist of a series of sandstones and conglomerates resting in almost horizontal beds on the worn surface of the schists. The sandstones extend south of Strath Fleet, but the hills decrease greatly in height, and beyond the Dornoch Firth form the rich arable lands of Easter Ross. The hills of the northern portion, though only 1000 to 2000 feet high, form a very dominant feature of the landscape from their abrupt and precipitous character. In several places they have been carved into commanding crags and deep ravines. One of the most romantic of the latter is the narrow wooded gorge of the Golspie Burn, which is spanned at its mouth by a railway bridge seventy feet in height. A walk is carried up the glen by the side of the stream as far as the falls, crossing from side to side by rustic bridges. Above the falls, which are most picturesque, the path ascends by steps and steep zigzags to an open wooded glen, and soon after emerges into the bare upper valley. The rocky glen of Loth is wilder and of more savage grandeur, a fit scene for the last retreat of the wolf.

The scenery of the interior is dreary in the extreme; the schists form rounded peat-clad hills with wide stretches of peat moss between. Yet it does not lack high mountains. Ben Klibreck and Ben Hope are second only to Ben More, but they fall far short of the grandeur and individual character of the more rugged mountains of the west; though it is true that, viewed from the west, the furrowed declivities of Ben

Hope tower to their full 3000 feet above the lake at their base, and, together with its massive outlines, produce an impressive effect.

The granite intrusions give rise to the hills near Helmsdale, but elsewhere are insignificant with the noble exception of Ben Laoghal, south of Tongue, which has been termed the "Queen of Scottish Mountains." It is an isolated mountain like its neighbours Ben Hope and Ben Klibreck, and much inferior to them in height, but it far surpasses them in beauty of form. The summit rises into sharp peaks which culminate in vertical crags, between which are deep corries, the haunts of the red deer. The highest point is appropriately called the "Castle," but others also inevitably suggest the ruined remains of some ancient stronghold. The Moine, between Loch Eriboll and the Kyle of Tongue, the plateau along the north coast generally, and the area between Strath Naver and Kinbrace, are typical regions of peat moors and bogs with lochs which, in their bare expanse and treeless shores, do little to break the monotony, but are the breeding-place of swarms of gnats. Yet even these districts have their moments of beauty. The view westwards from Badanloch is particularly fine when the fire and colour of a glowing sunset is reflected in the chain of lochs, while in the distance the towering form of Ben Klibreck and the castellated peaks of Ben Laoghal rise starkly up against the sky.

The schists contain few rocks of economic importance. A belt of marble at Shinness was quarried for lime by the late Duke of Sutherland during his extensive improvements, and a steam barge was placed on Loch Shin for its transport to the kilns at Lairg. Quarries for flagstones and slates were also re-opened by him on a large scale in the Moine at Melness, but that industry decayed on the introduction of cement, though the flags are still used for local building purposes.

It is only the west that deserves the epithet "mountainous" as popularly applied, but there no other term is adequate even from the first glimpse of the distant peaks, whatever the route by which they are approached. A very fine view is obtained from the moor above Bettyhill. The whole western horizon is a jagged line of peak beyond peak, a great contrast to the monotonous plateau of the north coast, with the few smoothly rounded masses blocking its southern horizon. The road from Lairg to Scourie is the only route which crosses right through this rugged belt. The pass by Loch More and Loch Stack is one of the most picturesque bits in the whole county. The road runs close to the loch through straggling birch wood, which climbs the towering mountain sides amid huge blocks of rock which have a most threatening aspect, seeming almost to overhang the road, while at frequent intervals the slopes are seamed by the white streaks of mountain torrents which descend from the very crest of the ridge and form some beautiful cascades. The finest view, however, is down Loch More to the almost perfect cone of Ben Stack, or across the reedy bays of Loch Stack to the white screes and long grey ridge of Arkle. Towards the north the mountains are again cleft by the desolate glen of the river Dionard, which is walled in on the south by tremendous precipices of over a thousand feet, while at the county boundary there is a wide gap of moorland, across which the road is carried at an elevation of only 536 feet.

In the western district of Sutherland the surface features are very largely determined by the geological structure, and this structure is singularly prominent, for, over the greater portion of the area, the scanty vegetation is quite inadequate to conceal the rocks, which are moreover strikingly dissimilar and weather into highly distinctive forms. The gneiss plateau, which extends southwards from Loch Inchard and is about ten miles wide, is made up of bare ice-worn hummocks, with innumerable lochs and tarns in the hollows, and, especially in the region between Loch Inchard and Loch Laxford, with even more numerous perched blocks which crown every ridge and form a very conspicuous and peculiar feature. A geological characteristic of the gneiss which has influenced

FIG. 3.—Coast near Scourie. The notch in the distant promontory and the gap in the foreground are both due to a dyke.

[*Photo by R. Lunn.*

in a minor degree the surface configuration is the remarkable series of dykes and sills by which it is pierced, which trend in a general west-north-west direction. Many well-marked hollows, which may be traced for miles, are due to the more rapid weathering of the basic dykes (see Fig. 3). The gneiss is also traversed by faults, many accompanied by broad bands of shattered rock, and these have produced greater effects, the best example being the straight south-west shore of Loch Inchard, whose direction is continued by the river and its chain of lochs almost to Loch Stack. As it approaches the grand escarpments to the east the gneiss rises to much greater heights and forms a well-defined ridge under a capping of younger rocks. From Ben Stack, however, an isolated cone of 2364 feet in height, the quartzite has been almost entirely removed.

The Parph, as the bleak north-west district is called, forms a separate region, consisting of more than eighty square miles of peat-covered mountain and moss. Nearly half the area is of gneiss; the other half consists of outliers of Torridonian sandstone which have been let down by faults. Neither formations show their characteristic features, but both combine to produce one of the dreariest and least interesting parts of Sutherland, except to the mineralogist.

The Torridonian strata are composed of red sandstones and conglomerates with well-marked stratification in almost horizontal bedding-planes. Owing mainly to this, they form magnificent cliffs wherever they approach the coast, as round the Parph and at the promontory of Rhu Stoer and the island of Handa. But the most notable are the grand inland escarpments which begin with the triple peaks and triangular

Fig. 4.—Suilven.

mass of Quinag, which stretches from Loch Cairnbawn to Loch Assynt. Towards the west the beds present a continuous line of lofty cliff for more than two miles, with sheer precipices of over six hundred feet. The view from the north across Loch Cairnbawn is most impressive. But most astonishing of all these mountains are the isolated ridges of Canisp and Suilven, which dominate the landscape for many miles. Their dark red cliffs rise abruptly from the grey gneiss plateau to heights of 2779 and 2399 feet, but in impressiveness they far exceed many mountains of much greater actual height. From the sea or shores of Lochinver Bay the ridge of Suilven is seen edgeways, and its peculiar shape has earned for it the nickname of "the Sugar Loaf."

The Cambrian strata, like the earlier Torridonian, occur in gently inclined beds. They were deposited on a plane of marine denudation, and in sections are seen to overlap the Torridonian sandstones and lie directly on the worn surface of the gneiss. They consist of three very

dissimilar formations—(*a*) white quartzite; (*b*) calcareous grits and shales; (*c*) limestones and dolomites. The whole series is very uniform throughout, even in its minor divisions. The discovery of Ollenellus in the middle division in 1891 fixed their horizon as Cambrian; before that they had been classed as Silurian from the general facies of their fossils.

The quartzite crowns the summits of the mountains on the western edge of the thrust belt along its entire length, and, from its elevated position and mode of weathering into long white screes, on which little vegetation can grow, it can be recognised many miles away and contributes a very important element to the scenery of western Sutherland. Ben Arkle is one of the finest examples (see Fig. 5).

Fig. 5.—Ben Arkle and Loch Stack.

[*Photo by R. Lunn.*

The thin middle series of grits and shales weather readily to a rich soil, so that they are generally hidden under vegetation; but the very luxuriance of this vegetation is a sure indication of their presence.

The limestone regions are in Assynt and Durness. Approaching Durness from the south the presence of calcareous beds is at once detected by the close short turf, and by the peculiar pitted appearance of the ground. Many other phenomena peculiar to limestone regions may be observed. Loch Borrolaidh and Loch Croisaphuill occupy hollows dissolved out of the rocks by chemical action; and a mile beyond the village of Durness is the famous Smoo Cave, which Sir Walter Scott has described so graphically in his diary of his northern tour. A few yards above the road the Smoo Burn suddenly plunges into a deep chasm, and on the seaward side issues from a large cavern into a long narrow gully up which the tide flows.

In Assynt considerable areas of limestone occur within the region of thrusts, and display similar features. Along the course of the Traligall River the outcrop of a minor thrust may be seen, part of which is laid bare. The burn flows along the outcrop, but two miles above Inchnadamff it has worked its way underground along the sole of the thrust, reappearing a quarter of a mile lower down. The old channel is quite clearly marked, but contains water only in times of flood. A short distance higher up the valley are two deep openings in the ground, at the bottom of which a stream may be seen flowing over this same thrust plane. A third cave opens out a little further on. It is a deserted water channel, and those interested may crawl through a short section of the old bed to a small grotto lit from above. Springs are abundant, and are beautifully clear and cold. Between Inchnadamff and Ledmore the gigantic Stronechrubie cliffs, with their mantling ivy and hollies, extend for over a mile and a half along the road.

In several places the limestone has been altered to marble by intrusions. These marbles are of various colours, some pure white, others veined, and richly variegated. An English marble merchant rented them at the beginning of last century, and opened up several quarries. Three years were spent in constructing a road to the coast, but in the end the quarries were abandoned on account of the cost of freight and the difficulty of obtaining large blocks. Extensive quarries of limestone were worked at Loch Eriboll. The lime kilns were erected near Heilom ferry, and a considerable trade in lime was carried on about thirty years ago, but the cost of fuel and the small local demand led to its abandonment.

Rivers and Drainage.

As in so many other cases, in Sutherland there is a marked difference between the western rivers and those flowing north or east. In the west they are short and torrential. The only large rivers are those draining extensive lochs, as the Kirkaig, Inver, and Laxford. The first two make their way to the sea through picturesque gorges whose rocky slopes are clothed with birch and fir. The Kirkaig flows through a very steep narrow glen, and plunges midway over a rocky ledge into a pool 60 feet below. The Laxford drains Lochs More and Stack, which have been already described. The scenery of the Inver may be appreciated by the accompanying view taken from the bridge near its mouth.

In the north and east wide cultivated straths are characteristic. The upper valleys are in all cases bleak and bare in the extreme, but as they deepen and widen, they afford room for meadows and fields, and give shelter to natural wood of birch and alder. The Oykell is the longest river. It rises on the slopes of Ben More at a height of 2000 feet, and has a total course of 35¼ miles. The upper part has little interest, except such as it possesses from being the boundary between Sutherland and Ross. Just above Oykell Bridge its channel narrows to a gorge through which the river foams, and gives rise to a fine waterfall. It is worthy of remark that both its tributaries, the Cassely and the Shin, have similar falls as they enter the main strath. At Rosehall the most

beautiful part of the strath begins, and presents a picture of meadow, field, and wood, enhanced by the broad river winding over its plain, and cottages perched on the slopes or nestling among the trees.

Very different is the strath of the Helmsdale, which was the scene of one of the most famous clearances, and is still occupied by sheep farms, which gives it a bare uninhabited look, only partially relieved by the birch woods and large fir plantations. Strath Brora is much more picturesque, especially near the loch, where, on the one side, the shores are clothed with birch and alder, and the steep sides of the valley are densely wooded, while on the opposite side the crag of Carrol Rock juts boldly out into the water.

In the north the Naver is the most noted strath, chiefly from its

Fig. 6.—The River Inver.

unhappy history, but also for its beauty which is much lauded, but does not impress the stranger from the south. The strath contains a good deal of wood, and the sides are very steep, the hundred feet beach forming a line of escarpment which can be traced for a considerable distance; but it lacks variety. Perhaps the former contrast of its dense population, with the unrelieved desolation of the moors around, may have been the secret of its charm. The other straths of the north are bare, and have little attraction for strangers.

The largest drainage system is still that of the Moray Firth, but it is almost equalled by the northern system, which is steadily encroaching on it, and will, no doubt, ultimately deflect still more of its waters.

The main watershed of the county, starting from its southern boundary, follows the crest of the western belt of mountains for about half its length, and then branches, one portion crossing the Parph in a north-westerly direction to Cape Wrath, the other running almost due south-east along a massive ridge of hills to Ben Armine, whence it turns north-east across a wide expanse of peat moss to the lower hills on the opposite side of the valley. Its course is therefore very irregular, something like an inverted W, and presents some curious anomalies. The greatest area of the county is drained by rivers flowing in the old consequent valleys, which have a dominant south-easterly direction, dividing the county into ridges of similar trend, and influencing very markedly the course of the roads. It is interesting to note that the two east and west routes through the centre of the county follow valleys which are continuous right through the mountain barrier of the west. The highest elevation of the road from Lairg to Scourie by Loch Shin is only 419 feet, and between Strath Oykell and Assynt 536 feet. It is equally worthy of note that there is no connection between these roads other than that down the west coast, which necessitates the crossing of Kylesku Ferry over the narrow neck of the long sea lochs, Cairnbawn and Glendhu, which penetrate right into the heart of the mountains. If a motorist found the ferry too rough to cross, as sometimes happened when the only means of transport was a large fishing-boat with planks laid across to form a platform for the car, the only other way round involved a journey of no less than 97½ miles.

In the north such conditions do not occur. In addition to the road from Durness, four other routes lead south between the mountains into a very broad open valley, which must once have been occupied by the River Helmsdale, but is now shared between that river and the Naver and Hope, which have cut back their beds so as to capture its head-waters. Although it is, for the most part, a marshy moor fit only for deer or sheep, yet it affords an important line of communication, and in its eastern portion forms the most direct route from Strath Naver to the railway at Kinbrace.

Another case in which the diversion of the drainage has produced results affecting the direction of the main routes, is that of Loch Shin, whose waters now find an outlet through the River Shin to the Oykell, but formerly flowed south-east by Strath Fleet. The two valleys, which converge on Lairg, are traversed both by road and railway.

Glaciation.

These modifications of the drainage were probably in large measure accomplished during the ice age, which has everywhere left abundant traces of its action. During the period of maximum glaciation the country was deeply buried under the ice, which radiated outward from central Sutherland somewhat east of the present watershed, as is shown by the direction of the striae on the western mountain. These mountains, being composed of extremely hard rock, have retained the marks with wonderful freshness, and even the finer scratches are still clearly

visible where the surface has been protected by a covering of soil. The most striking evidence of the powerful action of the ice is the mammillated surface of the gneiss plateau, with its smoothed and polished bosses of rock and innumerable perched blocks. The multitude of lochs with which its surface is studded lie in true rock basins, mostly shallow and irregular. Very many of them lie along veins or shatter belts, the softer rock of which has been more easily scooped out by the ice. The larger valley lochs are probably due to later stages of glaciation, when local ice-sheets gave rise to valley glaciers which followed the course of the present rivers, though there is evidence that in some cases they crossed low cols to neighbouring valleys. In Sutherland these local glaciers descended to sea-level, as is proved by their terminal moraines resting on the raised beaches. Good examples of these may be seen at Brora. In the north they would seem to have filled the larger valleys and extended right out to sea. At a later stage, represented by corry glaciers elsewhere, these northern glaciers still reached sea-level, for at the head of Loch Eriboll their moraines rest on the fifty-feet beach.

It is therefore evident that the northern part of the county and specially its western portion was subjected to very severe glaciation. The radiation of the ice during its maximum extension was somewhat across the valleys in their lower stretches, but in all cases there must have been a prolonged scour of the passes which separate the isolated mountains and formed the outlet for the ice-sheet of central Sutherland, and this must have had a much more powerful action in lowering the watershed at this point than the mere increase of rainfall towards the west could produce. Moreover, all these passes contain large lochs, and it is at least significant that the only rivers which have succeeded in capturing part of the eastern drainage are situated in precisely this district.

No county in Scotland has so large an area of fresh water in proportion to its size as Sutherland, where it covers 3·5 per cent. of the total area. With only very few exceptions, the lochs are due to glacial action. One or two in the limestone districts have been formed by chemical solution of the rock, and both Loch Sine, on the west side of Loch Eriboll, and Sandwood Loch, south of Cape Wrath, have been transformed from inlets of the sea into freshwater lochs by the action of the waves in heaping up bars of sand and shingle across the entrances.

As already mentioned, most of the lochs in the west lie in true rock basins, as do also all the largest lochs; but whereas the former are distributed irregularly over the surface, the latter lie in deep valleys between high mountains, and are typically long and narrow. Another class of lochs, equally well represented, consists of those due to the unequal accumulation of the boulder clay, or morainic material, with which the whole surface is strewn. Of such are many of the lochs on the higher cols and on the moors of the interior. Many corry lakes, also, are confined by the terminal moraines of former glaciers. In other cases the loch may be caused by the unequal resistance to erosion of the rocks of the valley floor. Loch Shin occupies such a basin, due to the induration of the schists at its lower end by the neighbouring granite intrusions.

Boulder clay covers most of the country in the centre and east, only the mountains and steeper slopes being free from it. In the east it forms the arable land, but in the centre it is mostly overlaid by peat. In the west and north morainic material is specially abundant, but all the larger valleys contain both terminal and lateral moraines.

A word may be said here about the Sutherland gold diggings which caused such a stir in 1869-70. The gold, which is of a very fine quality, was found disseminated in grains and small nuggets in the alluvium of the Kildonan burn and other tributaries of the Helmsdale river. It was also discovered in some other places, but in very minute quantities. Its ultimate origin is uncertain, as it occurs not in the rocks, but scattered through the glacial drift from which it has been washed by the burns. In 1870 mining was prohibited, as more damage was done than could be compensated by the license fees paid by the miners. Twenty-five years later the Duke of Sutherland agreed to reopen the diggings under special restrictions, with a view to determine their value. Gold was easily got, but in very small quantities, and only in the actual beds of the burns were operations at all profitable. It is now proposed to make another attempt to renew the industry if payable deposits can be discovered.

Industrially, and agriculturally, interesting attempts have been made to make the most of a remote, mountainous, and sea-girt country.

(*To be continued.*)

THE MINERAL SURVEY OF SOUTHERN NIGERIA.

By a CORRESPONDENT.

A SURVEY of the mineral deposits of the Protectorate of Southern Nigeria was authorised by the Secretary of State for the Colonies in 1903, and has proceeded since that date under the supervision of the Director of the Imperial Institute.

The object of the scheme, as described by the Director, is to "obtain accurate information respecting the occurrence in the Protectorate of mineral deposits of economic importance, as the first step towards their economic development." The results of the survey, to the end of the dry season of 1906-7, are summarised in three reports which have been published by the Colonial Office.[1]

Under the scheme approved by the Secretary of State two surveyors were appointed, who have spent the dry seasons of each year (from about the end of October to about the end of May) on field-work in the Protectorate, and the remainder of the year on the examination in the Imperial Institute of the specimens collected and sent home for further investigation.

[1] *Colonial Reports—Miscellaneous.*—Nos. 33. Cd. 2876: 67, Cd. 4994; 68, Cd. 4995. Oliver and Boyd, Edinburgh.

The work of the survey is still proceeding, and results of a later date than those described in the reports under consideration will be awaited with interest. But the survey has already covered a considerable portion of the Protectorate, and the Director in his reports indicates that the question of the development of the deposits already investigated by the surveyors is ripe for practical consideration.

The reports in question deal with the work of four dry seasons. In referring to the areas investigated during this period, it may be useful to glance at the recently published map of the Central and Eastern Provinces of Southern Nigeria,[1] which gives a clear general idea of the configuration of these two provinces: for the Western Province reference may be made to the general map of Lagos and Southern Nigeria.[2]

During the first season (December 1903 to May 1904) the survey party explored the region to the south and east of the Cross River in the Eastern Province, including the Oban Hills, peaks of which reach an elevation of 3500 feet. Beds of limestone were investigated on the Calabar and Akpaiyefe Rivers: and traces of tin, monazite, thorium and gold were found in the Oban region.

The second season (December 1904 to May 1905) was occupied with a detailed exploration of the upper waters of the Calabar and Kwa Rivers which flow from the western flank of the Oban Hills and enter the Cross River below Calabar. On the completion of this portion of the survey, a deposit of lignite or brown coal at Ibusa and Okpanam in the Asaba district, west of the Niger, was examined, and a preliminary exploration was made of a part of the Ifon district.

During the third season (November 1905 to May 1906) a detailed examination was made of the bituminous deposits in the Epe and Jebu Ode districts of the Western Province; of a lignite deposit on the Ogun River, south of Abeokuta, and of the lead workings north-west of the Cross River in the Abakaliki district of the Eastern Province.

During the fourth season (April 1907 to July 1907) a detailed examination was made of the lignite deposits in the Asaba district of the Central Province. A further inspection was made of the lignite deposit in the neighbourhood of Abeokuta, and a portion of the Ishan district in the Central Province was explored.

The most important deposits which have been examined during these four seasons are those of lignite or brown coal, which is shown to be widely distributed. Specimens from the various deposits have been submitted to careful examinations and detailed analysis, and the results are given with great minuteness (Cd. 4995, pp. 16 to 26). A comparison of the Nigerian lignite with that found in British Central Africa and German East Africa is made (Cd. 2876, p. 10), and it is further compared with lignite found at Palana in Rajputana (Cd. 2876, p. 19). The Director urges the prosecution of further practical tests, and these have already

[1] *The Central and Eastern Provinces of Southern Nigeria*, 1910. Compiled by Captain Beverley. Published by E. Stanford, Long Acre, W.C.

[2] *Lagos and Southern Nigeria.* Parts of Sheets 61, 73, and 74. *Africa*, 1:1,000,000. Published by E. Stanford.

been made on the river steamers on the Niger and on the Lagos Railway. On the map of the Central and Eastern Provinces a metalled road to the lignite workings near Okpanam, in the Asaba district, is shown. This is approaching completion, and will be available for motor transport, and a more thorough and exhaustive test of lignite taken from this area, which has produced the best specimens, will be possible. It would be premature to say that the discovery is of great practical importance, but the results of the investigation already made have been such as to justify more extensive tests.

In the examination of the bituminous deposits in the Western Province the surveyors have been able to avail themselves of the material rendered accessible by the operations of the Nigerian and West African Development Syndicate. Detailed reports of the results of analysis of samples sent home are given (Cd. 4994), and the present position of our knowledge of the extent and value of the deposits is summarised. The Director concludes that "there is a fairly extensive deposit of sand rather poorly impregnated with bitumen, accompanied by isolated outcrops of richer material of good quality." The possibility of making practical use of these deposits, it is pointed out, will depend upon their extent and the richness of the bitumen contained in the crude material. It is not however possible as yet to say whether any of the methods of separating bitumen from the formation in which it is found can be profitably adapted to the preparation of the Lagos bitumen. Evidence of the association of petroleum with the bitumen was found at a later date than the reports under consideration.

The existence of other minerals is established, but it is not at present known whether these are of sufficient extent to be profitably worked. Deposits of tin, monazite, and other valuable minerals have, however, been found.

The Director indicates the possibility of the publication of information obtained by the survey in connection with the geological structure of Southern Nigeria; but no such publication has as yet appeared. Reference may, however, be made to two papers read by Mr. John Parkinson, the first Principal of the Mineral Survey, before the British Association in 1906.[1] Mr. Parkinson points out that four distinct types of country in Southern Nigeria have to be studied. First we have the region of crystalline rocks commencing upon the Kamerun boundary, and extending in a rude semi-ellipse to the Niger in the neighbourhood of Idah; secondly, the region of Cretaceous rock has been traced round the base of the Oban Hills to Abakaliki near the Cross River, and appears to extend in a westerly direction towards the Niger River: thirdly, there are the Tertiary beds, conspicuous among which are the red sandy clays of Benin and Ijebu: fourthly, there is the region of the delta and mangrove swamps, flat and monotonous as seen from the sea, but interrupted by inliers of tertiary beds.

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[1] 'The Structure of Southern Nigeria,' and 'The Post-cretaceous Stratigraphy of Southern Nigeria.'—*Report of the British Association*, 1906, p. 622 and p. 561.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Lectures in January.

Mr. J. S. Dennis, Superintendent of Irrigation and British Columbia Land Commissioner, will address the Society on the "Colonisation of Western Canada" at Edinburgh on January 11th, and Glasgow, January 12th.

Dr. H. Karl W. Kumm will address the Society in Aberdeen, Edinburgh, Dundee and Glasgow on the 24th, 25th, 26th and 27th inst. respectively. The subject of his address will be his travels from "Hausaland to Egypt through the Sudan."

GEOGRAPHICAL NOTES.

Africa.

The Progress of St. Helena.—The Colonial Report for 1909 for this island (Cd. 4964) gives some interesting facts in regard to it, most of them not, however, of a very encouraging nature. Among the natural conditions which make progress difficult is the fact that the climate is extraordinarily variable. Thus in Nov. 1908 it rained every day, while in Nov. 1909 there was continued drought. This variability is especially disadvantageous when an attempt is being made to grow crops for a particular market. The islanders have been trying to grow new potatoes for the London market, the idea being that these should reach the market before other new potatoes are available, *i.e.* in April and early May. So far the climatic difficulties, together with others, have prevented the experiment meeting with any great success. Other agricultural experiments have also met with but moderate success. It is noted that the goat is a great obstacle to afforestation experiments.

The great lack in the island is the absence of any industries, especially for the men. A fibre mill for the treatment of the phormium grown in the island has been in operation for two years, but, as indicating the difficulties with which the industry has to contend, it is noted that an accident to the machinery caused the mill to be shut down last year for two months, which proved to be months when the London market was especially favourable. The delay was due to the necessity for waiting till a new cylinder was sent out to repair the broken one. Further, owing to the fact that the phormium plants grow with extreme slowness, it seems likely that the existing plants will be exhausted many months before the new plantations are ready, which would probably lead to the mill being shut for the greater part of the year just closed.

Lace-making has been started as an industry for the women, and has been established for a year and a half, but as yet the workers cannot compete in the open market with workers elsewhere. Only a few of

them can earn sixpence or ninepence a day with about ten hours' work, and it is reckoned that even these prices would have to be greatly reduced before the product could be put upon the London market.

Attempts are also being made to establish a fishing industry by salting mackerel or preserving tunny in oil, in order to occupy the men, but as yet the prospects of success are not very hopeful. Meantime the steady rise in the price of the necessities of life makes the situation of the islanders a very serious one. It is calculated that the cost of living in 1909 was from 20 to 25 per cent. higher than in 1908, while the rate of wages remained the same. In Jamestown the poverty is said to be extreme, the diminution in the number of ships which call affecting the conditions for the worse in many ways.

In spite of these facts it is remarkable that the population is increasing slightly, being 3577 in 1909 as against 3517 in 1908. The death-rate is remarkably low, being only 6·4 per 1000, and having decreased by 28 per 1000 in ten years, owing to the attention which has been paid to sanitation and hygiene during that period. The climate is very healthy, but the fact that it is warm throughout the year doubtless helps to account for the lethargy of the inhabitants, who in the old days were fed with but little labour on their part, owing to the presence of the garrison, and to the numerous ships which made the island a port of call.

Polar.

The French Antarctic Expedition.—From a preliminary report recently published we learn some of the important results of Dr. J. Charcot's recent expedition in the *Pourquoi Pas?* The work was taken up where the *Français* left off, and continued to the south. The coasts of Graham Land (to use the name in its original and more restricted sense) and Terre Loubet have been mapped. Adelaide Island, which turns out to be over eighty miles long, has been mapped on its eastern side. Alexander Land proves to be a large island, between which and Adelaide Island is the entrance to a large bay in the mainland, called Marguerite Bay. Several important points have been fixed on Alexander Land and much hydrographical work done in Marguerite Bay. After wintering at Petermann Island the *Pourquoi Pas?* proceeded to Deception Island which was explored and recharted. Then Bridgman Island was visited and a hydrographical study made of Admiralty Bay. More successful in her southern progress in the summer of 1909-1910 than the previous year, the *Pourquoi Pas?* sighted a new coastline in 70° S. and about 79° W., but ice forbade a near approach. Peter Island was sighted and the course continued westward to about 126° W. before the expedition turned homewards. The new land, which Dr. Charcot has not given a name, is a southern continuation of the Graham Land peninsula of Antarctica, and seems to exhibit the characteristic physical features of that land mass. It was unfortunate that no landing could be effected either there or on Peter Island. These discoveries disprove the possibility of any southern strait connecting the Bellingshausen and Weddell Seas, a suggestion which never obtained much credence in the absence

of any evidence in its favour. A considerable amount of oceanographical work was done, including soundings, surface and deep-sea temperature determinations, deep-sea dredging and work with tow nets and vertical nets. The soundings show the limits to the west of the continental shelf and have revealed the hitherto unexpected existence of a deep of 5000 metres to the south of the antarctic circle and west of Peter Island.

The meteorological results promise to be important. During the winter two first-class observatories were maintained at Petermann Island, one at sea-level, the other at 115 feet. During the summer cruises two-hourly observations were taken on board.

As regards the biological work little can be said until the collections are determined, but much material was gathered, although the deepest dredging seems to have been in about 280 fathoms. A number of interesting observations on birds are recorded. By labels affixed to penguins, it was found that the birds return year by year, not only to the same rookery, but to the same place on the rookery.

Dr. Charcot's expedition has been productive of valuable results, for it has been thoroughly scientific throughout, as one would expect of an expedition under his leadership.

A fuller account of the results was given by Dr. Charcot in his lecture to the Society, and this we hope to publish next month.

The British Antarctic Expedition.—The *Terra Nova*, the ship of this expedition, left New Zealand at the end of November for Macmurdo Strait. On arriving there Lieut. Evans, the commander of the ship, will give up his command to Lieut. Pennell, and will himself land with the majority of the western party. Captain Scott will proceed with the ship to King Edward VII. Land. It is hoped to land Lieut. Campbell and a party there about February 1, the party consisting of six men. When this landing has been effected, Captain Scott will return to Macmurdo Strait. Meantime Lieut. Evans and party will have begun their task of laying down depôts for the great southern journey, which is to begin next October.

General.

The Distribution of Plants and of Man.—In a recent issue of *Petermann's Mitteilungen* there appears an abstract of a paper read by Professor Dr. Scharfetter before a Congress in Graz, which dealt with the relation between plant distribution and human distribution, and includes some interesting, if speculative, points. The author notes that this relation may manifest itself in many ways. Thus, a particular plant association, *e.g.* a dense forest, swamps, etc., may form an almost insuperable obstacle to settlement by a particular race of men; or such settlements may be bound up with a particular useful plant, so that the group cannot extend beyond the zone where the plant grows, *e.g.* there is a relation in the Alps between the limit of permanent human settlements and the height at which cereals will grow; or the limit of growth of a particular plant may mark a complete change in the conditions which affects human distribution directly.

In regard to the first point it is to be noted that the early human groups of central Europe, both of the Stone and early Metal ages, seem to have been confined to steppe regions, which were naturally favourable to the growth of cereals; the groups which depended upon cereals were only able to conquer the woodlands at a much later stage. Thus the appearance of the plant association of *forest* marks a human boundary. Even when the attempt was made to extend ploughed land at the expense of the forest, it was the broad-leaved forest which was first attacked, the coniferous forest presenting a much greater difficulty. Its long persistence as a barrier to human distribution is curiously shown by the position of the Roman boundary (*limes*) in southern Germany. This virtually runs parallel to the limit of the Franconian coniferous forest, suggesting that the forest formed a natural boundary zone. Quite similar conditions exist with regard to the Roman boundary in Hungary, which runs along the line separating steppe and forest. Again, for long centuries the forest of central Germany separated the North Germans from the Celts, so that a plant association formed a boundary between two races.

Passing now to the second point, we find that there are not a few instances of races whose distribution has been closely bound to the area within which their useful plants could be made to grow. In this case, however, the influence exerted by plants depends upon their importance. Thus while the cereals have been pushed by man's efforts to the utmost limits to which they can be made to grow, other plants have been abandoned when changing conditions diminished their usefulness. Thus the vine was given up in parts of Germany and Austria when improved conditions of transport made it easier to import than to grow the product. Of the close dependence of a people upon a particular plant the Arabs furnish the best example. Briefly they may be said to have penetrated wherever the date palm could be made to grow. In its original home every human group has evolved in interdependence on certain groups of plants, and as it cannot suddenly alter its whole social polity, its spread must be largely affected by the possibility of growing these plants in its new home—this, of course, being especially true in the early stages when transport facilities are limited.

In the great chain of the Alps many races meet, and their boundary lines are not the high ridges of the chain, not even river valleys. There is some reason to believe, however, that plants, notably the sweet chestnut, are of great importance in this connection. In the case of such a tree one might suppose a direct effect, but when it is found that the distribution of plants which have practically no importance for human life similarly affects racial boundaries, it becomes clear that indirect effects are also important. The plants are an index of general environmental conditions which have profoundly affected human distribution, and this brings us to the third point, that plant zones mark physical conditions which influence human life as well as plant life. Of this the author gives some pretty examples. The limit of the sweet chestnut divides the Magyars from the Serbo-Croats, the Germans from Italians, while its limit in the Rhone valley above Martigny practically

coincides with the westward extension of the German language (cf. map, vol. xxii. p. 186). The author also notes as a curious fact that the limit of the cultivated chestnut runs parallel with the Rhine, and practically coincides with the battleground of the French and German nations. According to the author, the Germans strove all through the Middle Ages, but ineffectively, to cross the chestnut boundary, and earlier still the Romans strove equally ineffectively to push the limits of their empire permanently beyond it to the north.

With developing civilisation man's dependence upon the plant world becomes less, and the distribution of minerals, etc., begin to effect distribution greatly, but, in the early stages at least, plant limits must have had a marked effect, both directly and indirectly.

The Distribution and Causation of Goitre.—Dr. Charles Répin, of the Pasteur Institute, publishes in the *Revue Générale des Sciences* for September 15th last a very elaborate paper on this subject, which is of definitely geographical interest from two points of view. In the first place the prevalence of the disease and of the associated cretinism in many mountain valleys has a direct effect on the development of these valleys, and secondly Dr. Répin shows that there is a curious direct connection between topography and the existence of the disease. The following abstract has been limited to those parts of the paper which are of interest to the geographer, medical details being omitted.

To begin with, Dr. Répin accepts the view that goitre is associated with the habitual ingestion of a particular type of spring water, drawn directly from the source, and untreated in any way. The fact that boiling deprives such water of its noxious properties has led some to believe that the water is contaminated by a specific microbe, but Dr. Répin believes that goitrigenous water is merely a special type of mineralised water, and owes its properties to causes similar to those which give mineral waters their efficacy. Doctors have always believed, what the geologists were long indisposed to admit, that mineral waters drunk at the source have a physiological effect quite different from that obtained when they are drunk at a distance from the source. Recent work on radium has led to the discovery that mineral waters have a very high index of radio-activity, apparently due to the presence of little-known substances of great instability. So much is this the case that mineral waters are now recognised less by their mineral content than by their radio-activity, and their origin along the lines of deep and recent fractures in the earth's crust.

Dr. Répin next, by means of a series of maps illustrating on the one hand the distribution of goitre, and on the other the regions of the earth affected by recent folding and faulting, endeavours to show that endemic goitre is limited to regions where recent fractures in the earth's crust permit deep-seated waters to reach the surface. In the Alps in general, and in Switzerland in particular, there are many curious facts in regard to the distribution of the disease, especially the way in which it avoids the central massifs, while it rages in the marginal zone of

folding. Thus in travelling from Paris to Turin goitre first appears at Aix-les-Bains, and stops at Modane. In the valley of the Durance it only occurs in the zone stretching from below Briançon to the point where the river debouches on the plain of Provence. There is no goitre at Chamonix, at Sixt, nor at Servoz, but it occurs on all the slope of the Chablais which looks towards the Lake of Geneva. The valley of Aosta is known as one of the Alpine valleys where goitre and cretinism are most prevalent, yet there is no goitre at Courmayeur. In Switzerland, where detailed studies of the distribution of the disease have been carried out, its limitation to a particular zone in the region in which it occurs has been shown in great detail, and according to Dr. Répin these zones are zones of folding and fracture. A very curious little point is that it is known that surface waters of any kind, including glacial streams, do not produce goitre. When such surface waters are pure and can be used as drinking water goitre is absent. In many parts of the Alps, however, the presence of schists make the streams muddy, and then the inhabitants are obliged to drink spring water and goitre prevails. Where goitre is especially prevalent, as in the valley of the Arc, it is found that the water of these deep-seated springs is practically free from intermixture with surface water, whereas in regions where goitre is sporadic and slight, it is found that the arrangement of the rocks is such that the spring water is more or less mingled with surface water. The first condition occurs in regions of high relief, and the second in those where the topography is less accentuated, the cause being the different arrangement of the beds in the two cases.

An examination of goitre-producing water has shown that it possesses marked radio-activity, which, as in the case of mineral water, is soon lost. Further, just as mineral waters soon lose their physiological effect after they are drawn from the source, so, altogether apart from boiling, or any other treatment, goitre-producing water which has been allowed to stand, *e.g.* in filter beds, loses its pathogenic effect. The interest of this is that if the above views are well-founded they suggest the possibility of eliminating goitre from the mountain districts of Europe by some method of treatment of the water. When one recollects that there are Alpine villages in which almost every house has persons affected with goitre, and that long before cretinism sets in mental sluggishness appears, it is obvious that the disappearance of the disease would have an enormous effect on the development of these regions.

EDUCATIONAL.

A RECENT event of considerable importance to teachers is the appearance, in an enlarged form, of a new edition of Dr. Mill's little book called *Hints to Teachers and Students on the Choice of Geographical Books for Reference and Reading, with Classified Lists.* This book, it will be remembered, was published thirteen years ago, in 1897 (see review in this *Magazine*,

vol. xiii. p. 667), and the changes in regard to geographical text-books etc., have been great in the interval. The new issue is called *Guide to Geographical Books and Appliances*, has been revised by Dr. Herbertson, Mr. Unstead, and Miss Macmunn, and is published for the Geographical Association by Messrs. Philip (cf. our Book List, vol. xxvi. p. 614). Thirteen years ago geography both as a university and as a school subject had not won for itself the position which it now occupies, and this fact is reflected in the two books. Campaigns which were in progress when Dr. Mill's book was written are now finally settled, and the question is now how to utilise to the best advantage the territory which has been won. In this task the new edition will give great assistance, and we recommend the book most cordially to the notice both of teachers and of all those interested in the progress of geography. From the preface we gather that it is to be kept up-to-date in successive reissues, and the moderate price is considerably reduced to members of the Geographical Association.

It would of course be easy to criticise minor details; we have indeed noted various misprints, and various omissions which readers of this *Magazine* should be able to fill up. But only those who have done any bibliographical work know how difficult it is both to be perfectly accurate, and, where space is limited, to exercise a wise discretion in what is to be omitted and what to include. We add a few notes on points where we diverge in opinion from the editors.

One of the least satisfactory lists seems to us that on the geography of plants and animals, though some of the gaps can be readily filled in by diligent readers of this *Magazine*. Thus the very important series of botanical monographs issued by Professors Engler and Drude receives somewhat scanty treatment, but we have discussed the volumes fully here as they appeared, and indicated those which appeal to the geographer as contrasted with the systematic botanist. No reference is made to the careful botanical surveys of parts of Scotland and of England which have been made of late years, though these form useful applications of the general principles enunciated in some of the books mentioned. Kerner's *Pflanzenleben* is given as a title, with a note to the effect that an English translation is published; but it will be remembered that Professor Oliver's name appears with Professor Kerner's on the title-page of *The Natural History of Plants* as an indication that the English version is something more than a translation. We think also that details as to this English version should have been added. Again, the standard English book on animal life is stated to be the *Cambridge Natural History*. The ten costly volumes of this publication are, however, far from uniform in style and treatment, and many of them have virtually no value for the geographer as geographer. There can, we think, be no doubt that for the geographer's purpose one of the cheaper and less technical Natural Histories, such as the Royal, which is written on a uniform plan, forms a far more useful work of reference. Again, no date is given for Wallace's *Geographical Distribution of Animals*, which is stated to be the standard work of reference. It is of course the great classic, but the fact that it appeared thirty-four years ago should surely be indicated. In a rapidly changing

science like zoology thirty-four years is a long time, and many new facts have been discovered in the interval.

We put forward these criticisms not to diminish the gratitude which all geographers must feel to Dr. Herbertson and his coadjutors, but to suggest some annotations which teachers might make in their copies of the book. It is one which should be in the library of every school and institution where geography is taught, and should be carefully studied by the teaching staff.

We have received from Miss M. A. Hannan Watson, M.A., and Mr. James Hume, M.A., joint-Hon. Secretaries of the Geographical Section of the Philosophical Society of Glasgow, the syllabus of the Section for the current session. From this syllabus we note that a number of interesting papers have been or are to be read before the section, the speakers including Captain Lyons, the President of the Section, Professor Gregory of Glasgow University, and Mr. Mackinder. The subjects are eminently practical, and bear directly upon the work of the teacher. Last year excursions were also arranged in connection with the Section. Further information may be obtained on application to the Hon. Secretaries, 207 Bath Street, Glasgow.

We spoke here recently in connection with the drawing of memory maps of the confusion which prevails among many students of geography, and even among some of its teachers, in regard to the size and relative position of the different countries of the globe. In this connection it is interesting to note that there appears in the September issue of the *Journal of Geography* a series of geographical puzzles, which might well be used by teachers in checking their pupils' knowledge of place relations. We may select a few as being perhaps novel, and being of some interest. The author notes that :—The Pacific end of the Panama Canal is further east than the Atlantic end (cf. this *Magazine*, p. 16) ; that the entire continent of South America lies further east than Florida ; that the mouth of the Amazon is as near to Europe as it is to New York ; that Venice and Montreal lie in nearly the same latitude, and so forth. We might add that a series of figures and statements which would make clear the distortion of, *e.g.* North America on the familiar Mercator's projection would be even more useful, and would help to get rid of many popular misconceptions. Even the statements given above, however, may suggest to teachers new uses of maps, or new methods ensuring careful study of them.

NEW BOOKS.

EUROPE.

Rambles with an American. By CHRISTIAN TEARLE. London : Mills and Boon, Ltd., 1910. *Price* 10*s.* 6*d. net.*

Mr. Tearle has done excellent work before, and his new volume will be a pleasure to any bookish reader. The American of his narrative is alarmingly

familiar with the English classics, and has already done some work in tracing the homes and haunts of their distinguished writers. With him and the nominal writer, a London solicitor, we now follow in the footsteps of Shakespeare, Dickens, and Scott—his chief favourites—of Dr. Johnson, Hogarth, and others. He treats us to sound criticism, as in the observation that the lawyers in Dickens are first rate, but his law is nothing, while Shakespeare's knowledge of law is real and accurate. He indulges in spirited conjecture, as witness his idea of the manner in which the signatures to Shakespeare's will were written, and odds and ends of information are interspersed. London is the region chiefly explored, but Edinburgh and the Scott country are visited, also Stratford-on-Avon and Rochester. Many references in the classics are identified with localities, and there is a wealth of quotations and enthusiasm. The book contains more information than would be judged even from its 376 pages.

Down Channel in the "Vivette." By E. Keble Chatterton. With a Frontispiece in Colour and Fifty Illustrations. By Norman S. Carr. London: Sidgwick and Jackson, Ltd., 1910. *Price* 10*s.* 6*d.*

This is quite a pleasant book to read, though of a somewhat lighter type of literature than that which is usually noticed in these columns. It is simply the log of a summer cruise from Burnham-on-Crouch to Falmouth and back to Southampton Water in a four-ton yacht, set forth in clear and simple English; but it appeals to every one who has a strain of the salt water in his blood. The writer is specially to be congratulated on his not following the custom which prevails among too many amateur sailors, at least in their books, of showing their daring by leaving everything of importance to chance. Skill and foresight do not necessarily mar the pleasure of yachting.

The Chronicle of a Pilgrimage. Paris to Milan on Foot. By Harold Monro. London: Sampson Low, Marston and Co., Ltd. No date. *Price* 2s. 6d. *net.*

This is a light and interesting little book, which has something in common with Mr. Belloc's *Path to Rome*, but does not display the feeling for earth-form which gives that book so much geographical value, despite its vagaries. Mr. Munro looks at scenery rather from the point of view of the poet than the geographer, but his descriptions of familiar ways are fresh and charming.

Things seen in Spain. By C. Gasquoine Hartley. With Fifty Illustrations. London: Seeley and Co., 1911. *Price* 2s. *net.*

This is another member of an attractive little series of which we have already reviewed several volumes. Like the other volumes the present one is beautifully illustrated, and it gives a perhaps rather too roseate account of the people of Spain, their character, life, and art. To say that all Spanish women are beautiful and that all are contented seems a little extreme, but the book will certainly lead many people to desire to see the country on their own account and form their own opinions on the subjects with which the author deals.

ASIA.

Jungle By-ways in India. By E. P. Stebbing, I.F.S., F.R.G.S., F.Z.S. London: John Lane, 1910. *Price* 12*s.* 6*d.* *net.*

This is a vivacious description of scenes and sporting incidents taken from the diaries of an officer of the Indian Department of Woods and Forests, which, the

author tells us, are the outcome of sixteen pleasant and interesting years spent in that service. Along with the purely sporting side of life in India are combined notes on the habits of the larger animals, which show that Mr. Stebbing must have made good use of his opportunities as an observer and student of natural history. Written in a pleasant and unostentatious style, and illustrated with spirited sketches of animals taken from the life, the book may safely be recommended to all who take an interest in big-game shooting in those parts of India which still remain a paradise for the sportsman. The high grass jungles teem with game at the end of the monsoon, and Mr. Stebbing's descriptions of Christmas shooting-camps in the country which lies at the foot of the Himalayas, and of his experiences in the Central Provinces, form attractive reading. We would specially mention the chapters which deal with the pursuit of the Indian bison, or gaur (*Bos gaurus*), and the author's adventures with this probably the most dangerous of all animals; while the accounts of beating for tiger are exciting even for those to whom Indian "Shikar" is as a sealed book. That on Shooting Tips is a useful chapter for men who aspire to slay big game, and the author's sketches of the tracks of the various animals dealt with are quite a feature in the book. It is dedicated to "that good sportsman," H. E. the Earl of Minto.

Chota Nagpore: A Little-known Province of the Empire. By F. B. Bradley-Birt, I.C.S., F.R.S.S. With an Introduction by the Right Hon. Earl of Northbrook, G.C.S.I. With Forty-two Illustrations and a Map. Second Edition (Enlarged and Revised.) London: Smith, Elder and Co., 1910. *Price* 12*s.* 6*d. net.*

We reviewed this very interesting book at some length on its first appearance (cf. vol. xix. p. 558). Mr. Bradley-Birt notes in his Preface that in the last seven years considerable changes have occurred in the Province, due especially to the extension of the railway, which now runs direct to Ranchi, a town formerly seventy-five miles distant from any line. In consequence he has modified his book in various ways so as to bring it thoroughly up to date. Among other points we note that the Jhenia coalfields are developing steadily, the coolies employed numbering seventy-two thousand now as compared with thirty thousand when the previous edition was written.

AFRICA.

African Game Trails. By Theodore Roosevelt. London: John Murray, 1910. *Price* 18*s. net.*

In the year which elapsed between April 1909 and March 1910, the Ex-President of the United States found a congenial sphere for the employment of his indomitable energy in a sporting tour in Africa. Sport, however, was not the sole object of the tour. He was commissioned by the Smithsonian Institute of New York to make a collection of African birds, mammals, reptiles, and plants, and for this purpose he had with him his son Kermit, a boy of nineteen, who in the event proved himself a fearless, skilful, and successful hunter, and three distinguished American naturalists. When we add that the arrangements for big-game shooting were in the hands of that mighty Nimrod, Mr. F. C. Selous, who had willing assistance from several experienced local hunters, it goes without saying that nothing was wanting to make the expedition a brilliant success. It is needless to add that Colonel Roosevelt and his friends, wherever they went, received a most cordial welcome and valuable assistance from authorities and residents alike, a welcome and assistance, for which he was very grateful, and of

which he gives hearty acknowledgment. The results of the expedition, looked at from the scientific point of view, were everything that could be desired. The Colonel was able not only to procure a varied and valuable collection of specimens for the Smithsonian Institute, but also to augment the collections of several other institutions in the United States. So far as the details of the accounts of the campaign against the great game are concerned, the book contains nothing that we have not already learned from Selous, Schelling, and others, in the many works which have been published of late years on the subject of hunting great game in Africa. The interest of the book is to be found in the personality of the writer, in his enthusiasm and evident enjoyment of his holiday, in his observations on his surroundings, and in his comparisons of the conditions of America and Africa. The Ex-President, of course, does not fail to lecture; but we hasten to add that his lecturing does not irritate; in fact it is somewhat platitudinous. He is much more interesting when he is describing the scenery of the places through which the expedition passed, or remarking on the various and strange tribes with which he came in contact. He has, of course, the pen of a ready writer and unusual powers of observation; and he had exceptional opportunities of observing everything of interest wherever he was taken. Both he and his son availed themselves to the full of these opportunities, and Colonel Roosevelt with his pen, and his son with his camera, have between them compiled an excellent account of a very interesting and successful expedition.

A Voice from the Congo. Comprising Stories, Anecdotes, and Descriptive Notes. By Herbert Ward. With Illustrations by the Author. London: William Heinemann, 1910. *Price* 10*s. net.*

The title of this volume is a little unfortunate, because one is led to expect a tirade on the atrocities about which sufficient has been written. It is only a momentary repulsion, however, that one experiences, for the book is interesting and instructive in a high degree. Mr. Ward is no novice in book-writing any more than he is in knowledge of the Congo. In the present example he has produced a series of sketches of native life and character written with a sympathy for and an acquaintance with his subject which command respect. The illustrations, especially the reproductions of bronzes, are excellent, and the latter show that Mr. Ward is a sculptor who has won honour in the salons. Some of the tales are intensely dramatic, and the whole is a distinct contribution to the ethnology of the Congo.

Hunting Trips in Northern Rhodesia. By D. D. Lyell, F.Z.S. London: Horace Cox, 1910. *Price* 21*s. net.*

There seems no end to the supply of books on big game shooting in Africa. In the volume now before us Mr. D. D. Lyell describes some of his hunting trips in Northern Rhodesia, Nyasaland, and Portugese East Africa, and he has compiled an interesting and instructive account of his experiences in these localities. He himself announces that he has "no hairbreadth escapes" to relate; on the other hand he certainly had some "exciting experiences" which he relates in a graphic and telling way. A keen observer of nature and of the habits and doings of all sorts of wild animals, birds, etc., he is a true sportsman who abhors the killing of game simply for the purpose of slaughter. The feature of the book which will appeal to most of our readers is the numerous and excellent illustrations of animals. These did not all fall to the rifle of Mr. Lyell; the most of them fell to that of Mr. Garden. At the end of the book intending Nimrods will find some

useful and interesting remarks on the traits and character of the natives, remarks which will not always command universal assent; and also as to the cost of the equipment necessary or expedient for such an expedition.

Three Years in Tristan da Cunha. By Mrs. K. M. Barrow. London: Skeffington and Son, 1910. *Price* 7*s.* 6*d.*

Some account of Tristan da Cunha was given in an article in the *Scottish Geographical Magazine* in June 1905. It was there mentioned that, in 1902, the Society for the Propagation of the Gospel in Foreign Parts had vainly endeavoured to induce a married clergyman to go and settle in the island. In the autumn of 1904, however, the Rev. Mr. Barrow and his wife noticed an advertisement in a newspaper, calling for a clergyman to volunteer to go there. Now Mr. Barrow is the son of a lady who, as a child of four years of age, had been a passenger in the ill-fated *Blenden Hall*, which was wrecked in July 1823 on Inaccessible, the smallest island of the Tristan group, and so he decided to offer his services, which were accepted. It was, however, no easy business to get to Tristan da Cunha. It took Mr. Barrow and his wife five months to do so, and it was a much more difficult and tedious process to get away. In the volume now before us Mrs. Barrow gives copious extracts from the diary which she kept during her three years' sojourn in the island. As might be expected, life there is very monotonous—the principal excitement being the sighting of ships, the majority of which pass on without touching at the island. There seems practically very little or no change in the circumstances, population, manners, or condition of the islanders since the period described in this *Magazine* in 1905. Numerous photographs give the reader an excellent idea of the island and its inhabitants.

In the Heart of Africa. By the Duke Adolphus Frederick of Mecklenburg. Translated by G. E. Maberly-Oppler. With Maps and Numerous Illustrations. London, New York, Toronto, and Melbourne: Cassell and Company, Limited, 1910. *Price* 15*s. net.*

The African explorer will soon find his occupation gone. Duke Adolphus Frederick of Mecklenburg at the head of a large and accomplished body of experts made a thorough examination of one of the few remaining "white" spots during 1907 and 1908. We await with interest the forthcoming publication of the scientific results. If the summary under review is any guide, then these results must be of great value. It forms a very interesting narrative of the course of the expedition. Nothing strikes the reader more than the almost railway-like punctuality with which the different operations were duly carried out. Time and again the main body would split up into small parties, each with its own duties carefully mapped out, and almost invariably a certain date would see them again united, their work accomplished. This says much for the Duke's capacity as an organiser as well as for the ability of his lieutenants. The most interesting part of the volume is that which describes the great volcanic region in the heart of Africa, the existence of which so far from an ocean did so much to shake old theories. This investigation was under the special charge of Herr Kirschstein who spent six months over his task, and from whom an exhaustive treatise may be expected. Space does not permit of referring to the numerous other notable features of this volume, but no student of African geography can afford to neglect it. The illustrations, several of which are in colour, would form a small encyclopedia by themselves. We have nothing but praise for the part of the work which is the province of the publishers, the house of Cassell.

Mysterious Morocco. By H. J. B. Ward, B.A. London: Simpkin, Marshall, Hamilton, Kent and Co., Ltd., 1910. *Price* 2*s.* 6*d. net.*

This unpretentious little volume contains a number of slight sketches, describing the natural features of Morocco, the manners, habits, dress, religion, etc., of its inhabitants, and some of the events in its history. It will be useful for travellers in that country. The sketches are illustrated by some good photographs taken by the author.

AMERICA.

The True History of the Conquest of New Spain. By Bernal Diaz del Castillo. Edited and published in Mexico by Genaro García. Translated into English, with Introduction and Notes, by Alfred Percival Maudslay, M.A., Honorary Professor of Archæology, National Museum, Mexico. Vol. III. London: Printed for the Hakluyt Society, 1910.

The third volume of Bernal Diaz' *True History of the Conquest of New Spain* contains a number of quaint maps and plans of the Valley and City of Mexico, most of them compiled in the sixteenth century. In the words of the preparatory note, they will "make clearer and add to the interest of the description of Bernal Diaz of the operations in the Valley and the siege of the City which will be published in the following volume." There are also some useful and interesting notes explanatory of the history and details of the maps and plans.

Our Search for a Wilderness: An Account of two Ornithological Expeditions to Venezuela and to British Guiana. By Mary Blair Beebe and C. William Beebe, Curator of Ornithology in the New York Zoological Park, etc. London: Constable and Company, Ltd., 1910. *Price* 10*s.* 6*d. net.*

This is a very charming book. The authors went to South America with the evident intention of being pleased with everything. They enjoyed splendid health, and one reads little of the fevers, insect pests, deadly snakes, not to speak of the personal inconveniences and hardships which are traditionally associated with the Guiana forests. There is sufficient evidence, however, that all was not so rosy as the authors' enthusiasm would make us believe; witness the accident to Mrs. Beebe which curtailed the expedition. From the list of specimens, dead and alive, which were brought back to New York, it is clear that Mr. and Mrs. Beebe have accomplished work of great value among the birds of Guiana. The photographs and sketches alone are of great interest, and our only regret is that it has not been found possible to reproduce some of them in colour. The authors are anxious to return to Guiana to extend their work, and we hope their desire will be fulfilled.

The Old North Trail; or, Life, Legends, and Religion of the Blackfeet Indians. By Walter M'Clintock. London: Macmillan and Co., Limited, 1910. *Price* 15*s. net.*

It is now many years since the North American Indian race was said to be vanishing, and the works of Catlin formed a monument over its grave. Modern scientific methods, however, have proved that much is yet to be learned of and from primitive peoples, and Mr. M'Clintock is able to give us an ethnological contribution of great value. He was fortunate in securing the friendship of several old Indian chiefs who were repositories of the ancient knowledge of the Blackfeet branch of the great Algonkin race. They recognised that he was possessed of a

sympathetic character and was prompted by no idle curiosity, and so opened their hearts to him in a way that is probably unparalleled. The conclusion of the volume shows that with the death of the old chiefs, old customs are rapidly dying out. The present-day Indian is a farmer or a rancher, his children go to school, dress like the white people, imitate their modes of thought, in short are rapidly becoming denationalised. Whether in course of ages, as some think, the inhabitants of North America will in a sense revert to the ancient type, and so time bring its revenges, is a question beyond the author's purpose, and, indeed, merely speculative. In conclusion, we must praise the illustrations, those in colour being peculiarly appropriate to a book on a picturesque race.

Farthest West. Life and Travel in the United States. By C. Reginald Enock, F.R.G.S. Author of the *Great Pacific Coast*, etc. London: John Long, Ltd., 1910. *Price* 15*s. net.*

This is a well-illustrated and well got-up book, whose object is stated by the author to be "to present a survey of life in the United States, considered in the light of present social evolution." The style of the book and the methods adopted for the attainment of this end may perhaps be best indicated by a few quotations from the headlines of one chapter:—"Cold-blooded crime," "Bloody vendettas," "Inherent fiendishness," "Women lynchers," etc., etc. We have not noted any facts of geographical interest in the book beyond those which have been stated many times already.

The United States of Brazil. By Charles W. Domville-Fife. London: Francis Griffiths, 1910. *Price* 12*s.* 6*d. net.*

Mr. Domville-Fife tells us that he has written this interesting volume in the hope that it may "help to arouse in England greater interest than she has hitherto shown in the task that lies before the Brazilian people." And yet according to his own showing Brazil owes much, if not the greater part, of its present success and prosperity to British enterprise and British capital. After instancing the many improvements in the large cities of Brazil carried out with the help of British capital, he goes on to say "the railways in most cases are English owned, or even where that is not the case, their promoters were financed by British capitalists. The harbour improvements, the lighting, the street tramways and the principal fluvial navigation are all the results of supplies from the golden stores of the United Kingdom." But unquestionably he has done good work in calling attention to the boundless possibilities for immigrants into this great country; possibilities which seem to be better understood and appreciated by Germans and Italians than by emigrants from this country. The natural wealth of Brazil is unlimited, and up to the present time not one half of the territory has even been explored. The dangers arising from climate have been found to be much exaggerated, so that with ordinary care the immigrant has every chance of enjoying good health, except in certain malarious tracts; the dangers arising from barbarism and an unsettled government are now non-existent.

The future of Brazil seems to depend for the most part on two things, viz., the maintainance of peace abroad, and an abundance of the right sort of immigrants. With a wise foresight the Brazilian Government has in the interests of peace contracted treaties with its neighbours and many of the great powers for the settlement of disputes by arbitration, and it is also protected by the well-known Monroe doctrine; and in the interests of immigration it has taken effective measures in the more important European countries to divert capital, emigration and trade to

its shores. Mr. Domville-Fife had no easy task, when he attempted to condense his information and observations about the twenty-eight States which make up Brazil into a compass of 250 pages, some 50 of which are devoted to sketches of Old Brazil taken from the interesting pages of *Purchas his Pilgrimes*. But into the space that was available he has collected a great deal of information, which he places before the reader in lucid and crisp language which we trust will serve his purpose of attracting attention to Brazil. He concludes his work with the prognostication that "borrowing, as a basis of policy, American ideas of administration and British-Colonial methods of local state-government; adopting English theories of finance backed (largely) by British capital, and aided by Italian, Portuguese and German labour; protected from aggression by the Monroe treaty, which is made doubly secure by a moderately powerful army and navy;—Brazil will continue in this line of steady progress that she has marked out for herself, and will develop ultimately into a great and powerful nation of the New World." Let us hope that no untoward event may occur to thwart or postpone a consummation devoutly to be wished in the interest both of Europe and America. The book is equipped with a number of good photographs, but needs an index badly.

AUSTRALASIA.

The Island of Stone Money: Uap of the Carolines. By William Henry Furness, 3rd, M.D., F.R.G.S., author of *Home-Life of the Borneo Head-Hunters*. With Illustrations from Photographs by the author. Philadelphia and London: J. B. Lippincott Company, 1910. *Price* 15*s. net.*

The author resided for only two months in the island of Uap, but, thanks to his own energy, the docility of the natives, and the kindness of a white copra-trader, he was enabled to make very good use of his time. Obvious gaps occur, as, for instance, there are several references to a slave-class, but we are not told anything about its origin or present condition. The stone money, which gives the book part of its title, is, of course, the millstone-like discs described by former writers. There are references to cat's-cradle games, legends, marriage and burial customs. Good use was made of a phonograph as a receptacle of native songs, and no difficulty was experienced in obtaining good records. A grammar of the Uap language and a double vocabulary, both based largely on a previous Spanish work, complete an interesting, if slender, book.

Melanesians and Polynesians. By George Brown, D.D. London: Macmillan and Co., Limited, 1910. *Price* 12*s. net.*

In a recent number of this *Magazine* we noticed an able and erudite work on the *Melanesians of New Guinea*, by Dr. Seligmann, in which he put on record a vast amount of detailed information regarding one section of the Melanesians, who form the bulk of the population of that country. In the volume now before us Dr. Brown performs with equal ability and success a similar task for the Melanesians and Polynesians, who inhabit various islands in the Eastern Pacific ocean, *i.e.* the Samoa, Tonga, Fiji, New Hebrides, Solomon and New Britain groups. Dr. Brown has fully equipped himself for the task, as he has spent practically the whole of his life among these peoples, and has acquired a command of several of the languages, sufficient to enable him to conduct complicated ethnological, anthropological and linguistic investigations in a thorough and satisfactory way. He also received valuable assistance from his missionary colleagues. His object in the publication of this work is the laudable one of placing on record some of the knowledge thus

acquired of the manners, customs and folklore of the peoples amongst whom he lived for many years. A careful perusal of it enables us to confirm his claim that he has no pet theories to advance. He sets forth his own views in regard to debatable questions, as, for example, the original habitation of these islanders, with moderation, and he adduces good reasons in support of them, but he is never dogmatic. The chief value of the work is that it is a treasury of information regarding the habits, customs, unwritten laws, religion, institutions, folklore, etc., of these interesting races, acquired at first hand by a careful, patient, experienced and sympathetic observer, who has thus made a very valuable contribution to our knowledge of the sciences of anthropology and ethnology. Some of Dr. Brown's theories are likely to evoke criticism and discussion, as for example when he says of cannibalism, "I believe that cannibalism, so far from arising from a scarcity of animal food, is generally a semi-sacred rite, and in most cases is practised to discharge an obligation to the spirits of the dead." It is however obviously outside the scope of this *Magazine* to enter on a discussion of such a subject. The book contains many excellent photographs, and we cordially recommend it to the perusal of our readers.

GENERAL.

Echoes of Sport. By Hilda Murray (of Elibank). London and Edinburgh: T. N. Foulis, 1910. *Price 5s. net.*

This volume contains a series of brightly written sketches, describing the writer's own experiences of sport in Scotland, England, and Italy; and certainly her experience has been unusually varied. Stalking a stag on the Black Mount, playing a salmon in the Tay, partridge-driving in Peeblesshire, deep-sea fishing at Gairloch, hunting in the Roman Campagna, dry-fly fishing in Wiltshire; all comes alike to this enthusiastic and successful sportswoman, who has the happy gift of portraying to the reader her own emotions and sensations with remarkable skill. The volume is illustrated with photographs taken by the hands of several well-known ladies and gentlemen.

Outlines of Geologic History with Especial Reference to North America. Edited by R. D. Salisbury. Chicago: The University of Chicago Press, 1910.

This volume contains a series of essays on the principles of geological correlation, which were originally presented before the American Association for the Advancement of Science at Baltimore in 1908. In addition to the organiser, Bailey Willis, and the editor, Professor Salisbury, no fewer than fifteen other eminent geologists and palæontologists of the United States and Canada have contributed essays to the series. The value of such a collection is very great, as each writer discusses only the formation or subject which has formed his own special study. Although attention is directed primarily upon the geology of North America, comparisons and side-references to European conditions are not infrequent, and many chapters are treated on such broad lines that they cannot fail to interest geologists in other countries. Such, for example, are the essays on the Upper Palæozoic Floras, by David White; on the Faunal Relations of the Early Vertebrates, by S. W. Williston; on the Evolution and Distribution of Tertiary Faunas, by W. H. Dall; and the concluding chapter by T. C. Chamberlin on Diastrophism as the Basis of Correlation. A special feature of the volume is the series of palæogeographic maps, prepared by Bailey Willis. The general principles involved in the construction of these maps are explained in a most interesting supplement to the third

essay ; one wishes that this matter had been treated at greater length. The types of cross-hatching and stippling adopted on the maps are rather lacking in distinctiveness, and the effect is trying to the eyes. The only other comment which need be made is an expression of disapproval of the terms "Cambric," "Ordovicic," etc., as employed by Professor Grabau in his valuable essay on the older Palæozoics. One is glad to see that the editor of the volume expressly records his disapproval of these terms in a footnote on p. 44.

Economic Geology. By Heinrich Ries. New York : The Macmillan Company, 1910. *Price* $3·50.

This is a third and revised edition of Professor Ries' work, which is already well known in this country, in spite of the fact that it refers almost exclusively to American conditions. Practically every conceivable mineral which possesses or ever possessed any economic value is discussed in this most comprehensive work, and the text is illustrated by abundant maps, photographs, and tables of statistics. The last-named and many of the photographs and maps are taken from the publications of the United States Geological Survey. In a work of such scope, it is hardly to be expected that all chapters shall be of equal value, and one finds, for example, that some of the minor minerals and metals receive very brief treatment. This is particularly noticeable among the gemstones, all of which, including the diamond, are dismissed in nine pages. But coal, petroleum, and all the principal metals are treated with great thoroughness, and it would be difficult to imagine any improvement with regard to these. The chapter on the origin of ore deposits may be mentioned as a conspicuously clear and unbiassed summary of the latest views on this vexed question.

The arrangement by which the non-metallic minerals are treated before the metallics is a good one, because, as pointed out by the author, it leads from the simpler to the more complex forms of mineral deposits. Altogether this is an admirable text-book, which will be found almost as useful in this country as in America.

The Broad Stone of Empire. By Sir Charles Bruce, G.C.M.G. London : Macmillan and Co., Limited, 1910. *Price* 30*s. net.*

In these two weighty and instructive volumes Sir Charles Bruce has set forth the observations and conclusions of his long, varied and mature experience regarding the problems of British administration in the Crown Colonies, the "problems of an appropriate form of Government, appropriate laws, an appropriate population, appropriate methods of development, appropriate fiscal systems and an appropriate scheme of defence." It is obvious that no one need attempt to instruct the public on such important matters unless he has many exceptional qualifications for the task. He must have acute powers of observation, a broad, comprehensive and well-balanced intellect ; he must have a due sense of proportion, and he must have a prolonged and varied experience. A perusal of these volumes will at once convince the reader that Sir Charles, who lately retired from the Colonial service after an honourable career of thirty-five years, is well equipped with the qualifications which we have mentioned. But in addition to these he has other qualifications which are hardly less important. In the course of his long service in both hemispheres he had to govern men of different races, and often of opposing creeds and interests, and to deal with multiform perplexing social, political and economic crises. For the handling of these he brought to his work a kindly, although discerning, sympathy with and

appreciation of all sorts and conditions of men, and fearless courage and fertility of resource. The former met its just reward in the respect and affection as well as the obedience of those whom he governed; the latter enabled him to steer the colonies over which he ruled through periods of storm and stress into the calm waters of prosperity and peace. His judicious tact and capacity to deal with all sorts of problems won for him the appreciation and approval of Colonial Secretaries as opposite in their individuality as the brilliant statesman Mr. Joseph Chamberlain and the amiable routineer Lord Ripon. This book contains much worthy of earnest study by all engaged in the administration, not only of the Crown colonies but of the whole empire; for it is a mere truism to say, that the interests of the Crown colonies cannot now be separated from those of the rest of the empire. But besides this it is a book which should be read and studied by the public, for it was written for them rather than for officials.

In the hands of a dry and inelegant writer, the subject might be uninteresting or even repulsive. But Sir Charles writes with the easy and lucid grace of a practised author, who knows what his readers want, and the interest in what in other hands would be a most unpromising subject never wearies or flags. He has made a conscientious study of the voluminous literature already available on his subject, and he uses it with good judgment and effect in the elucidation of his own conclusions. Not the least valuable part of his work is the historical exposition of the various problems and questions with which he had to deal—an exposition in which he is obviously anxious to be accurate and impartial. In the course of so long and so varied an experience there were plenty personal incidents and occurrences, the relation of which from time to time afford a pleasant relief to the attention of the reader. For obvious reasons it is outside the scope of this *Magazine* to enter upon a detailed notice or review of the subjects discussed by Sir Charles Bruce, however tempting the theme may be.

But we may confidently say, that if any of our readers desire accurate and up-to-date information upon the multiform and perplexing problems in the Crown colonies, such as those incidental to labour, health, education, commerce and the like, they could not find a more interesting and trusty guide than Sir Charles Bruce. He does not dogmatise or claim to be infallible. Speaking of his own official career he frankly and wisely says "it has often been criticised, but the holder of responsible office who is never worth criticising is probably never worth anything at all. It has been a career of many mistakes, but the only men who make no mistakes are the men who do nothing." At its conclusion he retired taking with him the sincere regrets and good-wishes of those whom he governed and the regard and marked approbation of the authorities at home. He might have rested on his laurels, but he preferred to place his country, the colonies and the empire under an additional obligation by compiling this important work, which cannot fail to enhance his well-earned reputation as a statesman and colonial governor.

Hunting Camps in Wood and Wilderness. By H. Hesketh Prichard, F.Z.S., author of *Through the Heart of Patagonia*, etc. With a Foreword by F. C. Selous. Illustrated by Lady Helen Graham, E. G. Caldwell, and from Photographs. London: William Heinemann, 1910. *Price* 15*s. net.*

This handsome volume will be welcomed by all those who are familiar with Mr. Hesketh Prichard's work both in fiction and in travel. It consists of a series of sketches of hunting trips in Patagonia, Norway, Labrador, Newfoundland, and Canada, united by the common interest of the pursuit of big game. While not possessing any intentional geographical value, the sketches cannot fail to add colour to one's

preconceived pictures of the regions described by the author, pictures which, in too many cases one has laboriously to construct from the dry-as-dust details in text-books. The photographic illustrations illumine the text, but the drawings of Lady Helen Graham and Mr. Caldwell do more, they add something which mere words cannot do. The book may be cordially recommended to all lovers of out-door life, both as a fire-side companion and as a guide to sport in regions which, with the exception of Patagonia, are really more accessible than most people imagine.

Traité de Géologie. Par Émile Haug. *Vol. II.—Les Périodes Géologiques.* Fascicule 2. Paris: Librairie Armand Colin. n.d. *Prix* 10 *fr.*

We have reviewed here in some detail the earlier and more general volumes of Professor Haug's valuable treatise, and it may be sufficient from our point of view simply to state that the present part treats of the Jurassic and Cretaceous periods. A third part is to complete the second volume, that dealing with the geological periods.

BOOKS RECEIVED.

Mentone and its Neighbourhood: The Past and Present. By Dr. George Müller. Edited by Rev. J. E. Somerville, B.D., F.S.A.Scot. Illustrated. Demy 8vo. Pp. xii + 464. *Price* 12*s.* London: Hodder and Stoughton, 1910.

The River and I. By John G. Neihardt. With 50 Illustrations. Demy 8vo. Pp. ix + 325. *Price* 7*s.* 6*d. net.* London: G. P. Putnam's Sons, 1910.

Ayrshire (Cambridge County Geographies). By John Foster, M.A. With Maps, Diagrams, and Illustrations. Cr. 8vo. Pp. ix + 175. *Price* 1*s.* 6*d. net.* Cambridge: University Press, 1910.

Highways and Homes of Japan. By Lady Lawson. With a Frontispiece and 59 Illustrations from Photographs taken by the Author. Demy 8vo. Pp. 352. *Price* 12*s.* 6*d. net.* London: T. Fisher Unwin, 1910.

Stray Leaves on Travel, Sport, Animals, and Kindred Subjects. By James Conway Walter. Demy 8vo. Pp. xii + 295. *Price* 5*s. net.* London: Kegan Paul, Trench, Trübner and Co., Ltd., 1910.

The Isles of Scilly: Their Story, their Folk, and their Flowers. Painted and described by Jessie Mothersole. Post 4to. Pp. xii + 244. *Price* 10*s.* 6*d. net.* London: Religious Tract Society, 1910.

The Riviera (Grieben's Guide Books, vol. 131*): A Practical Guide.* With 8 Maps. Small 8vo. Pp. 153. *Price* 3*s. net.* Berlin: Albert Goldschmidt, 1910-11.

Ethnology of A-Kamba and other East African Tribes. By C. W. Hobley, C.M.G., A.M.Inst.C.E. Demy 8vo. Pp. xvi + 172. *Price* 7*s.* 6*d. net.* Cambridge: University Press, 1910.

Cyzicus: Being some Account of the History and Antiquities of that City, and of the District Adjacent to it, with the Towns of Apollonia ad Rhyndagum, Miletupolis, Hadrianutherae, Priapus, Zeleia, etc. By F. W. Hasluck. Demy 8vo. Pp. x + 326. *Price* 10*s. net.* Cambridge: University Press, 1910.

Islam in China: A Neglected Problem. With Illustrations, Monumental Rubbings, Maps, etc. By Marshall Broomhall, B.A. Royal 8vo. Pp. xx + 332. *Price* 7*s.* 6*d. net.* London: Morgan and Scott, Ltd., 1910.

Geographical Pictures (Black's School Geography). From Photographs. Series x. Valleys. Parts 1 and 2. Twelve Photos. *Price* 6*d. each.* London: Adam and Charles Black, 1910.

Commercial Geography. By Edward Van Dyke Robinson. With Exercises and References to accompany. Cr. 8vo. Pp. xi + 455. *Price* $1.25. New York: Rand M'Nally and Co., 1910.

The Great White North: The Story of Polar Exploration from the Earliest Times to the Discovery of the Pole. By Helen S. Wright. Cr. 8vo. Pp. xviii + 489. *Price* 10*s.* 6*d. net.* New York: The Macmillan Company, 1910.

The Ceylon Government Railway. By Henry W. Cave, M.A. (Oxon.), F.R.G.S. Demy 8vo. Pp. vi + 240. *Price* 3*s. net.* London: Cassell and Co., Ltd., 1910.

Overland to India. By Sven Hedin. With 308 Illustrations from Photographs, Water-colour Sketches, and Drawings by the Author. In two volumes. Demy 8vo. Pp. vol. I: xx + 419; vol. II: xiv + 357. *Price* 30*s. net.* London: Macmillan and Co., Ltd., 1910.

The Year-Book of the Scientific and Learned Societies of Great Britain and Ireland, 1910. Twenty-seventh Annual Issue. London, 1910. *Price* 7*s.* 6*d. net.*

Beasts and Birds: A Nature Book for Boys and Girls. By C. Von Wyss. Containing 55 Illustrations, Thirty of which are in Colour. Cr. 4to. Pp. 64. *Price* 1*s.* 6*d.* London: Adam and Charles Black, 1910.

A Dictionary of the Pathan Tribes on the North-West Frontier of India. 12mo. Pp. ii + 262. Calcutta: Superintendent Government Printing, 1910.

Islam Lands: Nubia, the Sudan, Tunisia, and Algeria. By Michael Myers Shoemaker. With 44 Illustrations. Demy 8vo. Pp. xii + 251. *Price* 10*s.* 6*d. net.* London: G. P. Putnam's Sons, 1910.

The Call of the Snowy Hispar. By William Hunter Workman and Fanny Bullock Workman. Two Maps and 113 Illustrations. Demy 8vo. Pp. xvi + 297. *Price* 21*s. net.* London: Constable and Co., Ltd., 1910.

The Great Pyramid Passages and Chambers. By John Edgar, M.A., B.Sc., M.B., C.M., F.R.F.P.S.G., and Morton Edgar. Cr. 4to. Pp. 301. *Price* 7*s.* 6*d. net.* London: Elliot Stock, 1910.

Le Pourquoi-Pas? dans l'Antarctique. Journal de la Deuxième Expédition au Pôle Sud, 1908-1910. Par Dr. Jean Charcot. Un volume in-8°. Pp. viii + 428. *Prix* 15 *fr.* Paris: Ernest Flammarion, 1910.

L'Enseignement en Chypre. Par Le Professeur René Delaporte. Demy 8vo. Pp. 15. Paris: Comité Dupleix, 1910.

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Administration Report of the Marine Survey of India for the Official Year, 1909-1910. Bombay, 1910.

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Foreign Import Duties, 1910. Cd. 5297. *Price* 4*s.*

Colonial Report (Annual).—Report of Hong-Kong, 1909 (659).

Colonial Import Duties, 1910. Cd. 5394. *Price* 3*s.* 1*d.*

Publishers forwarding books for review will greatly oblige by marking the **price** *in clear figures, especially in the case of foreign books.*

THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

A VISIT TO THE PHILIPPINES.[1]

By Mrs. Gabrielle Vassal.

(*With Illustrations.*)

Two years ago the American Government of the Philippines decided to hold a Medical Congress in Manila, their capital. All the countries of the Far East were invited to send delegates, and the French Government chose out my husband for this mission. He was to represent French Indo-China at the Congress, and later to furnish reports on different points of sanitary organisation.

This mission came as a most pleasant surprise to us. My husband was then attached to the Pasteur Institute of Nhatrang, in Annam, and as we had been stationed in this small out-of-the-way village for over a year, the prospect of a change of scene and milieu was most delightful.

We could reach the Philippines in two ways—either by going to Saigon and taking a steamer direct to Manila, or by going north to Hongkong, and from there crossing the China Sea. We naturally preferred the latter route, as we should be going over new ground. Fortune favoured us, for my husband received orders to go to Hanoi to interview the Director-General of Health before starting on his mission.

We left Nhatrang by the fortnightly mail steamer which follows the French Indo-Chinese coast from north to south. The Saigon-Hanoi railway is in construction, but will not be finished for some years. Three days later we found ourselves in Haiphong, which is the largest port of Tonkin. From there it was only three hours' train journey to Hanoi, the capital of Tonkin. The railway line traverses the Tonkinese delta, which is one of the richest rice-valleys in the world. The plain extended as far as we could see on either side, and every foot of ground was cultivated. The villages, crowded together behind high bamboo hedges, contrasted with the straggling Annamese villages.

[1] A lecture delivered to the Society in Edinburgh on December 7, 1910.

In Hanoi we were struck at once by the difference in climate and population between Tonkin and Annam. We had left Nhatrang under a fierce tropical sun. We were met in Hanoi by a chilly wind and the "crachin," which is the name given to a fine drizzle which falls during the winter months.

The Annamese of Tonkin, or the Tonkinese as they are called, are of a much bigger and stronger make than the Annamese of Annam, although they are of exactly the same race. They had colour in their cheeks and flesh on their bones. The women showed even a greater

A ferry-boat in Annam

contrast than the men: they were plump instead of wiry, and several inches taller than their Annamese sisters.

Hanoi is perhaps the daintiest town in the Far East. In the middle is a little lake which is dotted about with tiny islets on which stand native temples. Picturesque effects are obtained from every side. The French have added to the charms and artistic effect of the lake by surrounding it with green lawns and beautiful trees.

From Hanoi we went back to Haiphong and took boat for Hongkong. The three days and nights spent in that small boat do not bring back pleasant memories. The captain hardly left the bridge, except going through the Hainan Straits, when he came down to show us the

different vessels which had been wrecked there. It was not an exhilarating sight, and when a wave struck the ship with terrible force the following night, and all the cabins filled with water, we thought our turn had come.

We were very thankful when, through a thick mist, we saw numbers of Chinese houses like rabbit-hutches, built right on the quays, and were told that we had arrived at Hongkong. Our steamer was too small to bring out any of the big hotel launches, and we got into a sampan and were rowed to land by two strong, rosy-faced Chinese women.

On the quay at Hongkong—Chinese women.

They had tied their youngest babies on their backs, and their other children were attached by strong cords round the waist to a pole in the centre of the sampan.

Arrived at the landing-stage, there were so many sampans crowded round it that we had to scramble from one to another to get ashore.

When we had extricated ourselves, we happened to look upwards, and there, through a rift in the clouds, we saw houses perched on a rocky hillside almost immediately above our heads. Here and there, where the mist cleared, we saw others still higher up surrounded by pine-trees, and we felt as if we were in Switzerland. I had heard of the "Peak," where all the British live, but had always imagined a sort of plateau, and had

never expected to see buildings covering a steep mountain-side in such a manner. Every niche of flat surface had been utilised, and so steep is the incline that, when walking up the cement paths, a minute after passing the front door of a house, you are looking on to its roof or into the top story window. There are no horses or carriages at Hongkong, for, except along the narrow strip between the mountain and the sea (a piece of land which has been reclaimed, and where a tram now runs), there are no roads broad or flat enough for their use.

Even the grounds for hockey, cricket, and polo, which are essential

Chinese sampans in a corner of Hongkong Harbour.

to every Englishman wherever he may find himself, were unattainable on the island, and have had to be made on the mainland, ten minutes' distance across the water. From the Peak one sees thousands and thousands of Chinese sampans in the harbour (see illustration above), for a whole Chinese population lives upon the water. Besides the sampans there are hundreds of other vessels from all parts of the world.

On board the *Zaphiro* which took us from Hongkong to Manila, we made the acquaintance of quite a number of doctors who, like my husband, were taking part in the Congress. There were Englishmen from Ceylon, the Malay States, Singapore, Hongkong, Siam, Japan, and China, etc. This passage between Hongkong and Manila lasts two

days, and is one of the worst in the world. When we crossed, it certainly maintained its reputation. The doctors all prescribed for one another. For myself no prescription was needed. On our arrival in Manila we were met by the committee of management of the Congress. They took us off the steamer in a launch, and, for which I was still more grateful, also all our baggage. We were thus saved the nuisance of the Customs, which is the greatest drawback to entering America or her colonies.

Once ashore we were driven in motor-cars to the Ayumento, the Government office, and while the delegates went to pay their respects to the Governor-General, I wandered about in the neighbourhood with my camera.

The first monument which struck my attention was the Legaspi and Urdaneta monument. It was Legaspi who conquered the Philippines for Spain. He set out from Mexico in the middle of the sixteenth century, and before his death the whole of the archipelago was under Spanish control. This monument to the warrior Legaspi and the priest Urdaneta symbolised the Spanish régime. The Spanish always boasted of governing the people with a sword in one hand and a crucifix in the other.

I was very much interested in seeing the famous Walled City—the Intramuros. Manila is one of the finest examples of a fortified city of the seventeenth century. Moats surrounded the walls in Spanish times. When they have been filled in, as the Americans are now doing, a much better view will be had of these beautiful old walls. They vary in width from 3 to 40 feet, and are of great historical interest: for many a battle has been fought over them. Under the Spanish régime the Dutch attacked the city twice, but were repulsed. The British were the only nation to take and enter the town, and they occupied Manila for eighteen months.

The most beautiful buildings within the walled city are the cathedral church and convents. They indicate the vast importance of the Church in Spanish days. Every important village throughout the islands possesses its church, but those within the Intramuros are the most beautiful, and contain great treasures. Many date from the end of the sixteenth century, and they are most massively built, in order to resist earthquake shocks. The Philippines are volcanic in origin, and earthquakes are by no means rare. More than once they have caused great loss of life in Manila. While the churches have been built like solid blocks of stone—veritable fortresses—the houses are frail in construction, and are nearly all built of wood. The iron-latticed windows on the ground-floor, and the shutters of little coloured squares on the first story, give these narrow Spanish streets a very picturesque appearance.

The "caramata" is the typical vehicle of Manila. It is on two wheels, very light, and therefore suitable to the native pony. It resembles a London hansom, except that the driver is perched on what is little more than a narrow plank between the shafts, just behind the horse's tail. He hardly, therefore, impedes the view. The great disadvantage is the impossibility of mounting without dragging one's dress against the wheel, a fact I learned by bitter experience on my way to a dance.

I took several snapshots of the Filipino women, who were slowly wending their way to market, holding in one hand their baskets and in the other their trailing skirts. The skirt thus raised showed bare legs, and feet clad in heelless slippers. The bare feet of the Annamese do not even strike the eye, but it is quite a shock to see bare legs under a European skirt held up in European fashion. Their bodices were of different colours, but all made in exactly the same manner, and of the same stiff transparent material. It is a Filipino-made texture, and is like a coloured book muslin. The sleeves are very wide, but so strongly

Filipino women in a caramata in Manila.

starched that there is no fold, nor do they touch the arm except where they are joined to the bodice. The bodice is cut low behind and in front, and a stiff fichu of the same stuff is worn over the shoulders. The women are always bare-headed. Walking down the streets in as leisurely a fashion as the women were many white-dressed Filipino men. All wore European clothes, had their hair cut short, and looked very dapper. They are very much like the Annamese both in features and colouring.

When I got back to the Ayumento the doctors were just coming out. We mounted in motor-cars again, for every delegate was to be the guest of some American family. We had the pleasure of staying with an American lawyer and his wife—people whose kind hospitality we shall

always remember. Their house, an old Spanish one, was in a delightful situation overlooking the Passig River. Though of wood, it was comfortable down to the smallest detail, and most artistically decorated and painted.

Manila is certainly a very nice town, but it was sometimes difficult to show all the appreciation and enthusiasm which was evidently expected of us. The Americans call it the "Pearl of the Orient," and are quite convinced that no other town in the Far East can compare with it for climate, cleanliness, artistic effect, hygiene, amusements, etc. But many of the Americans come direct by transport, and many have not therefore even seen Hongkong. If they had visited Saigon or Hanoi they would not perhaps find Manila so extraordinary. Some ladies even seemed to think that the tropical fruits were peculiar to the Philippines. When a friend once offered us mangoes she told us that it was a fruit which we did not know, but which was delicious, and wanted to explain to us how to eat it. I was asked more than once if there were oranges in Annam! An American asked my husband if the houses were as well constructed in Hongkong. He had, needless to say, not seen the beautiful residences on the Peak.

In some years Manila ought certainly to be a splendidly organised town. The plans which Burnham has made for its expansion comprehend a city of 2,000,000 inhabitants, instead of 200,000 as at present. Provision has been made for parks and playfields, for an enormous hotel, for Government buildings, for the Philippines University, for science buildings, where all branches of scientific and research work can be carried on in close proximity. The present Spanish town will only be the heart and kernel of a new city, infinitely more spacious, clean, and sanitary.

The doctors were not kept too hard at work. In between the sessions they were taken to see the principal places of interest in and round Manila.

One day we went to see Fort M'Kinley, the army centre of the Philippines, another day Cavite, the naval arsenal. It was in Cavite Bay that Admiral Dewey sunk the Spanish ships on May 1, 1898, and bombarded the town. There was no defence; not one of the forts round the bay answered the firing. For some years previous to the arrival of the Americans the Filipinos had been discontented with Spanish rule, and since the execution of their poet and patriot, Rizal, in 1896, they had been in open rebellion. Aguinaldo, the leader of the revolutionists, had been deported by the Spanish. When the American fleet arrived at Cavite in 1898 it was he who proclaimed in advance that the Americans were the friends of the natives. This is probably the principal reason that there was no defence.

After having taken possession of the islands with the help of Aguinaldo, the American Government did not feel justified in leaving the people to the mercies of the Revolutionary army, which represented a minority of the population, and decided to stay. Very soon hostilities commenced between Aguinaldo and the Americans, and it was only a few years ago that peace was established. Even now some districts of

the Southern Islands are still under military rule. The war-like Moros, who, though comparatively few in number, always remained independent of Spanish control, are only being slowly subdued.

We were taken to the leper hospital just outside the town, and to the hospital for treating opium-smokers. Since 1908 opium-smoking has been practically stamped out of the islands. The severity of the Americans equals that of the Japanese, and the "Chinese Exclusion Act" of a few years before did much to prepare the war against opium. We visited some of the "Bureaux of Health," and were shown the details of the sanitary organisation of Manila, which has now a pure water supply and an adequate sewage system. It was difficult at first to make the natives use modern contrivances. For instance, the metal garbage tins with which every family in Manila was provided to prevent them throwing their refuse on the streets were found so useful for roofing houses that they had soon all disappeared. But the effect of hygienic methods is making itself felt. Epidemics of cholera and smallpox are ceasing.

One day we were all invited to lunch by the owner of a large cigar factory. It was one of the largest and most modern in Manila. We saw machines which turned out over 200 cigarettes a minute. Filipino girls made them into packets of 50 or 100. They never counted them, but picked them up and wrapped them in their paper coverings with astonishing rapidity. They never made a mistake, however; the number was always exact. All the cigars are made by hand; it takes a long time for an experienced Filipino to make a cigar. It was most interesting to see their slim, deft fingers rolling and cutting the leaves. The best leaf in a bunch was naturally always kept for the outside.

Every doctor was presented with a parcel of each sort of cigarette and cigar. Being a lady, I was only given one cigar, but the size made up for the number, as it was about twelve inches long. It is still waiting to be smoked.

The seed of the tobacco plant was introduced by missionaries into the islands at the end of the sixteenth century, soon after the Spanish possession. In 1781, for the purpose of raising greater revenues, it was decided to make the growing of tobacco a Government monopoly. This measure immediately improved the quantity and quality of the export, but it resulted in practical slavery for the tobacco-growers. They were not allowed even to smoke their own products. The profits of the Government during the monopoly were enormous, but the discontent grew so great that in 1882 it was abolished. All Filipinos, men, women, and children, smoke. By far the larger part of the crop produced and manufactured in the Philippines is consumed at home. About 3,500,000,000 cigarettes are consumed a year, and as the population is about 8,000,000, it may be easily believed that more cigarettes are smoked per head here than in any other country.

In many a Filipino household a huge cigar hangs from the roof by a piece of string, and father and mother and children all smoke at it when the fancy takes them. In the Cagayan Valley women may be seen smoking (without help) cigars twenty to thirty inches in length.

Hemp-raising is an even greater source of wealth to the Philippines

than tobacco. Philippine hemp is superior to all other known fibres for the manufacture of ropes and cordage, and is the principal export of the archipelago. Wherever you go almost in South Luzon you see hemp fibre hanging out like washing to dry. The fibres are as delicate as the hair of one's head, and become silvery white when drying.

The Governor-General was at that time Leonard Smith. His predecessor, who did so much for the new Colony, was Taft, now President of the United States. He was one of the original Commissioners sent out from the United States in 1901. The Commission is the name given to the governing body of the Philippines. Taft had not long been a member of the Commission before he was made Governor-General. Under his administration the country was conquered more effectually than by arms. His understanding of the natives, and the series of laws which were passed under his direction, called forth the gratitude of the Filipinos, and made him popular with his compatriots. He was nicknamed Santo, or the Saint. His activity was prodigious; he visited every corner of the islands. In districts where he could not drive he rode. Taft, as you know, is very big, and the great difficulty was to find a pony that could carry him when visiting out-of-the-way villages.

In many ways the Filipinos resemble the Annamese. A welcome is not only extended to the stranger and foreigner but to the needy relative. As in Annam there are no beggars nor professional paupers. Though ancestor-worship is unknown, the aged receive almost as much respect as in Annam. The Filipino, like the Annamese wife, helps her husband in his business, and he seldom enters on a transaction without her advice. She directs the household, and is saving and industrious. Gambling is, perhaps, the chief vice of the people. Instead of gambling on games of chance as in Annam, they gamble on their horse-races, and chiefly on their cock-fights. A Filipino will stake his last penny on a favourite cock. As one goes through a Filipino village it is curious to see the householder at his door holding his cock in his arms and massaging its legs. As we stroke and caress cats here, so the Filipino boy and man stroke and caress their cocks.

The great difference between the Filipinos and other races of the Far East is that they are Christians—not Christians newly converted, for they have been Catholics during several generations, in fact, since the Spaniards arrived three centuries ago. They observe the rites and ceremonies of the Christian religion most faithfully—more so, perhaps, than the average European, and their chief fêtes and social gatherings take place at baptisms, weddings, and other religious ceremonials.

A baptism is a most important ceremony, and all the village attends. The god-parents take their pledge most seriously, and will often educate their god-children even though they are not connected by blood ties. A baptism or wedding is often followed by dancing. This is the chief amusement. The rich Filipinos of the towns and the poor of the provinces all dance marvellously. They dance our dances, the waltz and two-step minuet, as well as native dances. A rowdy dance like our kitchen lancers is unknown; they always maintain a certain dignity. In

the country villages the women always retain the heelless shoe. Dancing is not confined to the young; the native matron dances with ease and grace even when she is a grandmother.

But what strikes the visitor especially about the Filipinos, is their love of music. There is hardly a Filipino who does not play some instrument, and every village throughout the country possesses its band or orchestra, which is quite as good as in any country village in

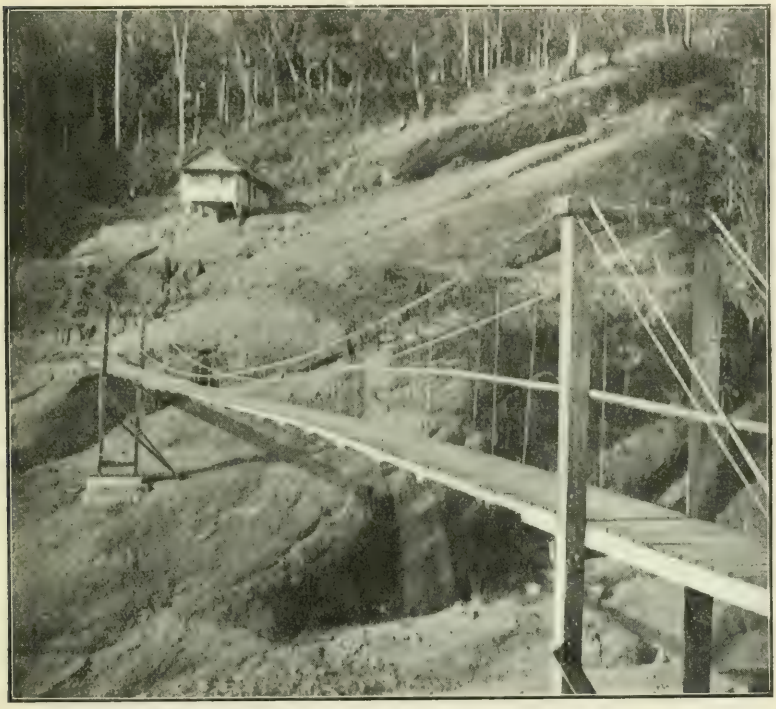
Igerots with bows and arrows.

Europe. Every church has its choir. They learn very quickly, displaying extraordinary technique and understanding. They are the only Oriental people capable of playing our music. In Tonkin the French have often tried to teach the natives music—even if it were only to form a drum-and-fife band. But every attempt has been fruitless.

In Manila we often went to hear the Constabulary band play on the Luneta. This band gained second prize at St. Louis World's Fair. The Luneta is a large open space overlooking Manila bay, and is laid out with grass lawns and well-kept drives, where every evening between

five and seven all Manila congregates. The four o'clock rush for games is not so conspicuous as in an English colony, and the gathering on the Luneta is always a large one. It is the moment to see the *élite* of the Americans, Spanish, and Filipinos of the town as they drive round in all their glory, some in landaus and victorias drawn by fine American or Australian horses, others in high dog-carts or caramatas with spirited native ponies.

Fortunately for us the Manila Carnival of 1908 coincided with the Medical Congress. For months preparations had been going on for



One of the bridges on the Baguio road.

this great event. Attractive advertisements had been sent throughout the Far East in the hope of bringing visitors from other countries. It was intended that this carnival should surpass all other fêtes and processions ever held in the Orient. If there were fewer foreigners than was expected, all the islands of the archipelago, on the other hand, were well represented, and Manila was crowded. The land parade, which was a procession right through Manila, and the water parade, a fête on Manila Bay, were the chief features of the carnival.

Before leaving Manila let me say a few words about the American policy as originally proclaimed. This policy can best be given in the words of President Taft when he was Secretary of War: "Shortly

stated, the national policy is to govern the Philippine Islands for the benefit and welfare and uplifting of the people of the islands, and gradually to extend to them, as they shall show themselves fit to exercise it, a greater and greater measure of popular self-government. . . . When the Filipino people as a whole show themselves reasonably fit to conduct a popular self-government, maintaining law and order and offering equal protection of the laws and civil rights to rich and poor alike, and desire complete independence of the United States, they shall be given it."

This is an ideal policy—perhaps no European country has proclaimed a higher standpoint of its duty towards a native colony.

Whether it will succeed remains to be seen, but up till now no efforts have been spared. Filipinos share with the Americans some of the highest Government offices. There are four on the Commission; the Chief Justice is a Filipino, and the Assembly or Lower House, elected on a restricted franchise, consists entirely of Filipinos. The Speaker of the Assembly, a native, outranks all people in the islands except the Governor-General or Vice-Governor. We were surprised to see that at official receptions and dinners he had precedence of the General commanding the American Army in the Philippines and of all the foreign consuls. Perhaps the best example of the zeal of the Americans in their new colony was the introduction of their public school system. Most nations show a little reticence in educating the natives over whom they rule. There was no hesitation on the part of the Americans. As rapidly as possible common school education was put within reach of nearly every child on the island, poor and rich. As the Filipinos, like many other races in the Orient, are extremely anxious to learn, the schools were filled as rapidly as they were opened. In 1898 before hostilities with the revolutionaries had ended, eight schools were opened in Manila. In 1901 five hundred American teachers, mostly women, arrived on a transport from the United States, and were distributed all over the islands. Hardly were certain districts built when schools were opened and teaching began. In 1906 there were a thousand American and four thousand Filipino teachers on the islands. English is the base of the education, and even in 1906 there were more children who could speak English than had ever spoken Spanish.

Under the Spanish Government the friars were the teachers of the people. They were averse to the Spanish language becoming general, as it would have reduced their influence not only with the Spanish Government but with the people if they could no longer be intermediaries. In country villages a priest was not only the teacher, he was the mayor and inspector of police: he allotted the taxes and collected them. It was this predominance of the priests which lost the Philippines to Spain.

One can hardly imagine a greater change for a country than that which the Philippines has undergone. No two administrations could be more unlike than the Spanish and American. From one day to the next everything was changed. Not only every detail of administration and organisation was entirely new and strange to the Filipinos, but the democratic principles of the Americans, instead of the caste system, upset their social strata and all social courtesies.

When the Congress ended, the foreign delegates left the islands, with the exception of my husband, who wished to visit Baguio, the hill-station of Manila, and compare it with the Lang Bian Plateau in Annam, of which he had made a special study. We were given every facility for this expedition, and Dr. Heiser, the Director of Public Health, himself accompanied us. We left Manila by train at 5 A.M. one morning. This line, which was the first in the islands, was laid down, as far as Dagupan, by a British firm during the Spanish régime. The Americans have lately bought it, and have continued it from Dagupan to the foot

The road from Manila to Baguio.

of the Benguet Hills, in which Baguio lies. No regular trains had started running in 1908, but a working trolly was put at our disposal, which saved us several hours driving in the hot sun.

At the foot of the Benguet Hills the line stopped, and there we found a stage-coach with four mules and a negro driver awaiting us. We immediately entered a narrow gorge and started the marvellous ascent. High mountains covered with tropical vegetation shut us in on either side, and an impetuous torrent rushed at our feet.

The difficulties of this road were so great that the first engineer gave up the job, saying that it was impossible. But the American Government

without the slightest hesitation put the road into the hands of another engineer.

Just what Baguio is to Manila, it is hoped that the Lang Bian Plateau will be to Saigon. Both are of about the same altitude, that is, five thousand feet, and both are about the same distance from the European centres. The temperature at this height is of course quite different from that of the plain. The climate of Saigon makes a hill-station quite as necessary as the climate of Manila. But whereas the Baguio road is already finished, from Saigon one can only go to the foot

Governor Pack's house on the Baguio Plateau.

of the hills. After that one must ride or be carried on a palanquin up steep rocky paths. As perhaps you may remember, I told you something of our journey to the Lang Bian Plateau in my lecture last year. Just as the Mois, the hillmen of Annam, differ from the inhabitants of the plains, so the Igerots (see illustration on p. 66), the hillmen of Baguio, differ from the Filipinos round Manila. The Mois and the Igerots resemble each other both in appearance and in customs.

Before the Baguio road was finished, a military camp, two hotels, and the Governor's house were in process of construction. Six months after their completion there was a "season" at Baguio. It is already a recognised thing that the Commission (the governing body of the Philippines)

shall hold their summer meeting up there, and the Governor-General and many of the Commissioners are building themselves private houses on the plateau. No time has, therefore, been lost, and no pains spared to make the hill-station a popular summer resort.

OVERLAND TO INDIA.[1]

(With Illustrations.)

In this, the latest book from the pen of Dr. Sven Hedin, the great explorer gives an account of his journey across the Persian desert to Baluchistan and India. The journey was but a preliminary canter for his greater explorations in Tibet—the Trans-Himalaya—of which we have heard and read a good deal, but it is characteristic of the man that the former was undertaken in a true spirit of discovery. As he says himself in his preface to the present work, "My route did not touch one of the famous centres of Iran. I diligently avoided routes trodden by the feet of others." "The journey proper began at Teheran, and outside the gates of Teheran begins the desert; and there is nothing but desert all the way to India." Day after day, until many months had passed, Dr. Hedin's caravan wended its way across the dreary wastes of sand which extend south-eastward from Teheran to Persian Seistan, and from thence across Baluchistan to Nushki, where he met the western tentacle of the railway to Quetta and India. It is a monotonous journey of which the two handsome volumes contain the log, or diary. Much of their space is taken up with strings of strange place-names, and records of heights and distances which are more likely to be of interest to future travellers over the same ground (if there should be any such!) than to the average reader; yet there is much of fascination in the story which Dr. Hedin has to tell, and we who have followed him on his way seem at length to hear the clang and jingle of the bells on the camels as they pursue their stately course over the great, silent desert spaces. Camels are not usually regarded as lovable animals, but those which were in Dr. Hedin's train appear to have won his affections, as well as the affections of his faithful Persians, and the account of their parting at the end of the long journey is quite touching. The leader's own riding camel was a grand beast, and Dr. Hedin tells us that he scarcely dared to speak when he bade it farewell "lest his voice should tremble," while "honest Meshid Abbas embraced the camel and kissed him on his mouth."

The two volumes are all about deserts, and the author has not very much to chronicle in the shape of adventures by the way. Indeed he says that "travelling in Persia is calm and peaceful as on the country roads in Sweden": but, like the deserts, the book has its oases when bits of vivid description help to carry the reader on. It is adorned by a

[1] *Overland to India*, by Sven Hedin, 2 vols. London: Macmillan and Co., Limited, 1910. *Price* 30s. *net.*

large number of photographs (some of which are reproduced here by the courtesy of the publishers), and numerous spirited pencil drawings from the hand of the author give a good idea of the types of people met by the way. Two admirable maps by Lieut.-Col. Byrström are a help to the reader in following the journey.

Dr. Sven Hedin arrived in Batum towards the end of October 1905, in the midst of a revolutionary strike, of the effects of which he gives a vivid account. Two weeks were lost in vain attempts to get a starting point from the Caucasian coast before he was able to smuggle himself on board of a steamer at Batum for Trebizond. The usual way from Batum to Teheran is by rail to Tiflis and Erivan; but this road was barred by the strike, so Dr. Hedin arranged to drive all the way from Trebizond to Teheran, a trifle of about 810 miles. The roads for the first part of the way were excellent, "not what one looks for in Asiatic Turkey." The road winds round the base of Ararat, which name, Dr. Hedin points out, applies more properly to the high land on the middle course of the Araxes, the mountain itself being called by the Turks Agri-dagh, and by the Persians Kuh-i-nu, or Noah's mountain. Nakichevan, or the grave of Noah, a town in the Caucasus, is a den of thieves where Tartars and Armenians are engaged in murdering each other. Dr. Hedin believes that Russia, acting on the principle of *divide et impera*, incites Mussulmans against Christians, and then lays hands on the combatants. He makes a pilgrimage to the grave itself.

"The crypt beneath which the venerable old Noah lies and ponders over all the evil and deeds of hatred that his descendants have wrought in the world during the ages since he rested the ark on the summit of Ararat."

Julfa, on the Araxes, which marks the border between Russian and Persian territory, is the southern terminus on the railway from Tiflis and Erivan, and it is interesting to note that Russia had obtained a concession from the Persian Government for the construction of a road from Julfa to Tabriz. In this connection Dr. Hedin writes:—

"It was quite evident that in this undertaking Russia had plans for a railway in prospect: for all the blastings, cuttings, embankments and gradients were planned for a railway line, and little more was needed than to lay the rails upon the track. This railway will give the deathblow to the old caravan route from Trebizond, and, thanks to the prohibitive tariff at Batum, Russia will then render impossible any attempt at competition, and will control all the north Persian trade."

A service of motor cars had also been ordered from Russia to run between Julfa and Tabriz. Four years have elapsed since Dr. Hedin's visit, and the political situation has changed in the interval, but it is probable that this road is included in the scheme for an Anglo-Russian railway to India.

At Teheran Dr. Hedin had an audience of the Shah Muzaffar-ed-din, who died in 1906. The capital seems to have lost much of its charm for the visitor. Dr. Hedin speaks of "the hideous streets where dirty, badly kept European tram-cars and leaning lamp-posts form an unpleasantly

crude contrast to the tones of Oriental life," and "like many other Levantine towns further to the west, it threatens to become more and more a cesspool of adventurers, fortune-hunters, and quacksalvers."

The start from Teheran for the long trek of 1490 miles across the deserts to Nushki in Baluchistan was made on 1st January 1906. Dr. Hedin says that he looked upon his undertaking "simply and solely as a lesson in geography," and he hoped that he might find opportunities of crossing districts which had never before been visited by Europeans. The caravan was made up of eight men and fourteen camels, and Dr. Hedin speaks highly of the cheerful, willing service which he got from his personal attendants, also from the three camel men, and from the two Cossacks who accompanied him as guards. He opened a fresh diary on New Year's Day, and, as he leaves the outskirts of the capital, he says :—

"In a few days we should leave the last village behind us, and then lose ourselves in a country where no tidings of the outer world penetrate, where no vegetation grows, but yet is so rich in mystical and unaccountable fascination, and where only the winds of heaven sing their dirges over the home of the hyena and jackal."

At Veramin, which is some two days' journey to the south of Teheran, Dr. Hedin deliberately forsook the caravan route through Yezd and Kerman which leads to Seistan, and pushed out into the unknown.

"The villagers regard with evident astonishment our slowly moving train, wondering why in the world we take this road and how we can conceive the mad idea of marching straight into the jaws of the desert."

Writing and map-making on camel back Dr. Hedin regards as all in the day's work :—

"I sit comfortably and freely, as in an easy chair, with my legs hanging on either side of the front hump. With compass and watch at hand, and a clean sheet of paper spread out on a piece of cardboard in front of me, I now begin a map of the route which is to be extended to Nushki, and when finished will occupy 234 sheets. Distances are calculated from the camel's stride, which I measure daily along a line 200 metres in length."

In spite of his fight with death in former years in the deserts of Central Asia, he was eager to return to the desolation of this God-forsaken land :—

"I seemed to hear its mysterious voices calling to me from its depths, 'Come home.' Beyond the great desert, I had a vision of the blue snowclad mountains of Tibet, but now the desert must first be conquered."

Much of the journey thus begun is uneventful, until we come to the story of the dangerous crossing of the Kevir or Great Salt Desert. This lay entirely off the line of march, and, in order to accomplish the crossing, Dr. Hedin had to spend some days at Jandak waiting for fair weather, to leave his own caravan, and to hire special "jambas" or fast-

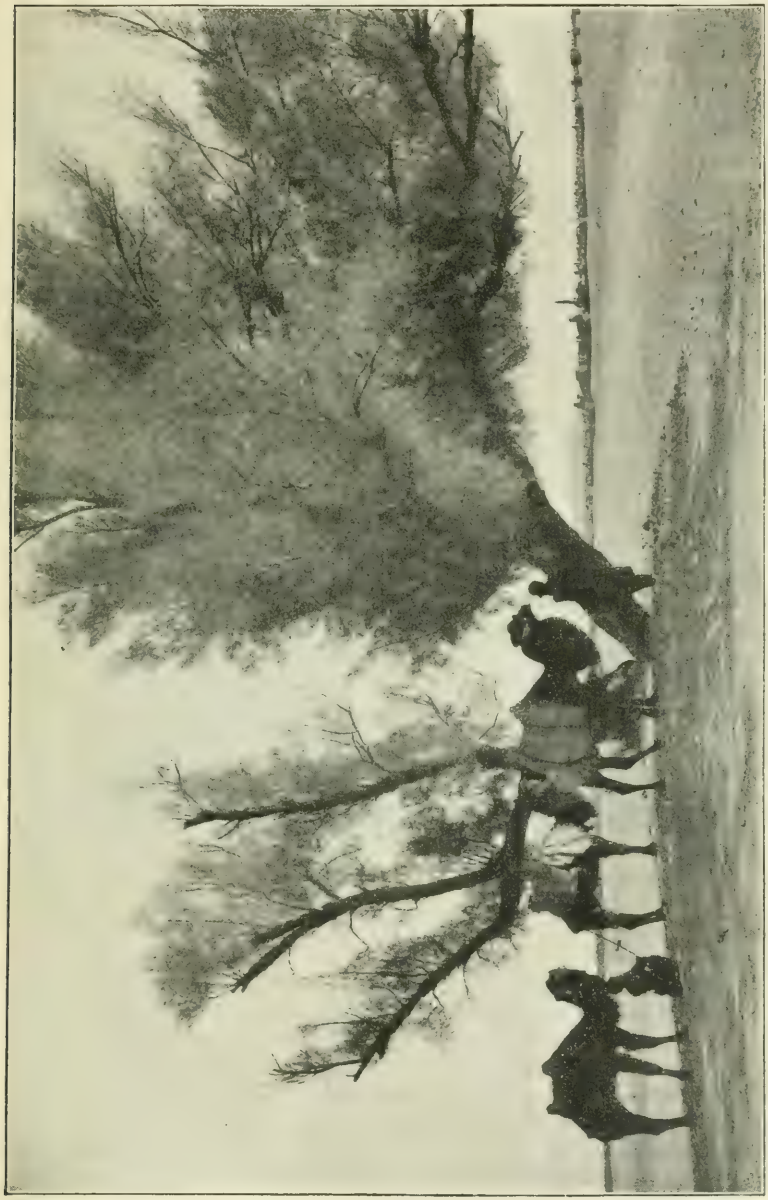
running dromedaries to carry him north across the Kevir from Jandak to Sudfe and Kurut, and back from the latter place to Khur, where his own caravan was to await his return—a ride of 250 miles. It is characteristic of the man that he should have exposed himself to all the toil and hardship and danger of this ride. The country surrounding the Kevir seems to contain a number of valleys, or deep erosion furrows; those on the north side coming from the southern spurs of the great Elburz range. Dr. Hedin's idea is that the Kevir is what remains of a great lake, or inland sea, under a crust of salt; into it the streams flow after heavy rains, washing masses of silt into the depression which forms the bed of the Kevir. Its dimensions, as mapped by Dr. Hedin, are, roughly, 140 miles long, by 80 across at the narrowest part.

The wet salt crust of the Kevir.

It is crossed by caravans going from the south to Semnan during the dry season when the salt crust affords a footing for the camels. But it becomes dangerous in the rainy season, as the camels are unable to keep their footing on the slippery surface, and the lives of both men and animals are imperilled on the half dried-up lake by breaking through the salt crust into the mud and water which lies beneath. Dr. Hedin managed to make the double crossing in safety by forced marches with his fast dromedaries, but he narrowly escaped being caught by the rain which fell in a deluge just after he had re-crossed, and which would have made his situation desperate had it come upon him in the midst of the Kevir. We would refer our readers to the book itself for the story of this perilous journey.

Snowstorms appear to be of frequent occurrence in north-east Persia during the winter months, and Dr. Hedin got into a bad one after leaving Teheran with his train of camels. Life in the villages which lie

scattered about the desert, wherever there is a well, must be hard on the women, as Dr. Hedin speaks of them as being dirty but good-



The great tamarisk outside Tebbes. The town is visible in the background with its lofty minaret and its encircling walls.

looking when they are young, but old and worn-out when they are not much over twenty.

Towards the end of February the caravan arrived at Tebbes, a romantic walled town standing in the midst of its beautiful oasis. A garden was allotted to the party for a camping place, and Dr. Hedin was able to pitch his tent on a lawn where two rippling canals made refreshing music. Unlike Teheran, "the market-place of Tebbes can pride itself on its genuinely Oriental character, where not a breath of European influence, and not a sign of foreign merchandise disturbs the perfectly uncontaminated sanctity of an oasis which is far removed from the clutches of Christian strangers." Dr. Hedin arrived at Tebbes in time for the festival of Moharrem, and we have from him a striking description of the passion-play in which actors represent the martyrdom of Hussein at Kerbela. The religious passions of the crowd of faithful Shiites are aroused to the highest degree, and a band of fanatics execute a strange march during which they hack their heads and foreheads with knives until the blood streams over them, all the time uttering yells of "Ya Hussein." The governor of Tebbes had surrounded Dr. Hedin with a strong guard, his two Cossacks were armed with loaded rifles, and under their protection he was able to take some good photographs of the scenes of the passion-play.

On the way south from Tebbes to Naibend a deviation was made from the route to take in a portion of the Bahabad Desert, "where no European has set foot, except, possibly, Marco Polo." The name itself of Bahabad implies the most complete desolation: "No wild asses or gazelles haunt this desolate region, where neither man nor beast wanders." The stay in the waterless country had to be cut short, and, after some days, Dr. Hedin resumed his march for Naibend, which is reached after crossing some difficult hill country. Here another oasis is found, "where the hand of man, in co-operation with nature, has produced an earthly paradise in the midst of this hopelessly desolated and God-forsaken country." Like Tebbes, Naibend is isolated, and is only in communication with the rest of the world by small and little frequented caravan routes, but Dr. Hedin says that a hasty visit to it repays a journey through the whole of Persia. The views of the village crowning the summit of a rock and surrounded by palms are certainly attractive, and Dr. Hedin describes the men of Naibend as being "handsome, peaceable, and cheerful, as they ought to be in such a terrestrial paradise."

From Naibend the road lay south-east to Neh, where alarming reports were heard that bubonic plague was raging in Seistan and the people dying like flies, also that Neh was practically cut off from Seistan. Quarantine was established at Bendun on the frontier of Seistan, and an Indian doctor had been told off to examine all wayfarers at that point. Seistan is naturally a rich and well-watered country, but the people are poor and downtrodden, being squeezed by the Governor, who farms his post and makes all he can of it. The prevailing poverty renders the people liable to be seized by the epidemic:—

"The Governor would be hanged in the name of humanity if there were any justice in this iniquitous world. But he takes care of himself, and the

Government must have its 150,000 tuman. The worst is that all the leading men in Persia deserve hanging, for, as the country is now managed, it must advance quickly towards complete dissolution and ruin."

It is to be remembered that the revolution in Persia has taken place since the above was written.

At Neh, Dr. Hedin sold his faithful camels, which were led away by their new owners; but his followers elected to go on with him through Seistan and face the terrors of the plague. The Hamun (lake) was crossed on a flotilla of "tutins" or canoes made of bundles of rushes tied together, and which are punted across the shallow, reedy waters of the lake. Arrived at Nasretabad, on the Helmund, near the border of

The Baluchistan Desert. The tree is a saxaul (*Anabasis ammodendron*).

Afghanistan, Dr. Hedin was made welcome at the British consulate where a small band of six Englishmen were engaged in fighting the plague, and in trying to keep in check the fanatics who were doing their best to render useless any preventive measures. Here he bade farewell to his six servants who had been his companions on the long journey from Teheran, and, with a fresh caravan of seven dromedaries, and a new escort, he set forth on the last stage towards Quetta. Afghan territory was tabooed, and after crossing the Helmund, he followed the frontier line of pillars south to Robat, where he entered Baluchistan. Four men took turns in carrying a portable boat. The road through Baluchistan was no improvement on what had gone before, but rather the reverse:—

"It is blazing hot shortly after sunrise. No clouds, no breeze, but a light haze hovering over the earth. . . . Grey, barren, and dreary, one can hardly

imagine a more God-forsaken wilderness than this. Gadflies persecute the dromedaries, and stinging flies irritate and tickle their noses, so that they are always snorting and puffing to get rid of their obstinate tormentors. . . . There is a region in south-western Afghanistan called the Desert of Hell. The name would be equally appropriate for north Baluchistan."

Quetta and civilisation were reached on the 13th May, just half a year to a day since the traveller had left Trebizond. Four delightful days were spent among the officers of the garrison at Quetta before taking the train for northern India and Simla.

"Soon appears a background of heights, soon the fall of fresh brooks is heard. Up yonder the cooling winds sing among the Himalayan cedars of Simla, and still higher, beyond the eternal snow, is the land of wild asses and yaks."

We can only refer here in a word to the chapters which deal with the march of Alexander the Great, and with the records of Marco Polo's famous journey across Persia, but we have said enough to give a faint idea of the contents of a remarkable book which is full of interest, and is a valuable contribution to our knowledge of unbeaten tracks in Persia and the Middle East.

A VISIT TO LAPLAND.

By A. L. Cross.

(With Illustrations.)

Lapland has hitherto been a little-known country, and the extension of the Swedish Railway system to Narvik, in Norwegian Lapland, has opened a new and very interesting region to the inspection of the traveller. The journey from Stockholm to Riksgränsen, the boundary betwixt Sweden and Norway, well within the Arctic circle, takes nearly three days by express train. Sweden is a big country, though possessing a population of only about 6,000,000. From Malmö in the extreme south-west, opposite Copenhagen, to Riksgränsen, in the north-west corner of Sweden, the distance by rail is over 1300 miles.

The country on the way north betwixt Stockholm and Upsala, Sweden's famous university town, is flat and uninteresting, if the journey is made by rail; but by boat, through Lake Mäler and up the river Fyrisa, the route we took is interesting from the historical associations as well as from its sylvan scenery. The summer houses of the wealthy Swedes occupy lonely situations on the sides of the lake. On the way to Upsala the steamer touches at Sigtuna, once one of the largest towns in Sweden, as the vast ruins of the churches of St. Olaf, St. Laurentius, etc., testify. Beyond Sigtuna the steamer stops at Skokloster, once owned by Field-Marshal Wrangel, now belonging to his descendants, the Counts Brahe. It is used as a museum.

Upsala is a nice, clean town of some 24,000 inhabitants. The

cathedral is a splendid building, and quite unique. It was built about 1287, but has suffered from fire, and its very new appearance is accounted for by its having been reconstructed in the years from 1883 to 1893. We saw there the tomb of the celebrated botanist, Linnæus, and also that of Emmanuel Swedenborg. North of the cathedral and close to the here very small Fyrisa river, is the celebrated spring of St. Eric. The famous university, founded in 1477, is close to the cathedral. It was well endowed by Gustavus Adolphus, and seems to be well equipped at the present time. At the time of our visit the midsummer holidays were on, but the janitor showed us all the class-rooms ; unfortunately

Group of Laplanders.

the library, Carolina Rediviva, was closed. There is a large castle in Upsala where the eccentric Queen Christina abdicated in 1653. It is now the residence of the governor of the province. Gamla (old) Upsala is about three miles distant, and here Linnæus lived, at a place called Hammarby, which is open to the public.

Sixty miles north of Upsala one may be said to enter the forest regions of Sweden, and only small patches of cultivated ground are to be seen along the rivers, and on the coastline. What strikes one as marvellous is the wealth of water both in river and lake. There is, perhaps, nothing like it in any part of the globe. Practically all the way from Bräcke, the junction for Trondhjem, where the main and only line to the north branches off, there are rivers and lakes every five miles of the way, not insignificant streams, but of the size of our Tweed and Tay,

and larger. On some of the great rivers, a short distance north of Bräcke, such as the Indals and Angerman, mighty rivers both, there is a considerable population. These rivers, when we were there, were full of floating timber on its way to the Gulf of Bothnia, where the logs are secured at the small seaports, and this occurred right up to Boden, the first town of importance in Lapland one comes to. When one approaches the Arctic circle the fir trees, even though the stems are thick, begin to show the effects of the great cold, the branches having a pinched look, and being very short, which may arise from their extreme closeness. Inside the Arctic circle, north of Boden and Kiruna, the firs seem all like the Xmas trees used at children's parties. At the river Gide, in latitude 64° north, the highlands of Sweden begin, though the country cannot in any way be called mountainous. North of the Gide, up to Lapland or Lappmark, as it is called in Sweden, the country seemed all forest and lakes, with no cultivation of any sort visible. At Nyaker, a station on the main line, we entered a very long double cutting, protected overhead by a boarding to keep out the snow in winter. Beyond Nyâker the large river Öre was passed, and then only a few miles further on the mighty rivers Ume and Vindel, draining innumerable lakes, stretching up to the Norwegian boundary. These two rivers join at Vännäs station, and enter the Gulf of Bothnia at an important town called Umea, quite a modern place, as the old town was burned down in 1888. Umeâ is connected with the main line by a short branch line from Vännäs. Beyond the Vindel the line passes the fine, rapid river Skellefteâ, having its source in many large lakes.

It is wonderful in summer to be in a country where it is for a time constant daylight. At 10.30 P.M. we arrived at Boden, an important place near the frontier of northern Lapland, and it was almost as light then as at 10.30 A.M. Boden has a population of 3500, and is the junction for Lulea on the Gulf of Bothnia, and Morjärv, north-east of the Kalix Elf, about 42 miles from the Tornea, the frontier of Russian Finland. Continuing north-west from Boden, but through for the most part a very bare and desert country, the next important places we reached were Gellivara and Kiruna, towns about the same size as Boden, but more recent in origin. Before the advent of the railway this part of Lapland was an unknown country, even to the Swedes themselves. It had been known as far back as 1735 to abound in ironstone, and two English companies had tried their hand at digging for it, but no real progress was made till 1890. Now, since the opening of the railway, this part of Sweden has become of great importance, and accordingly Boden, Gellivara, and Kiruna, speedily became large towns. At Kiruna there is a mountain from which the ironstone is quarried out and sent by rail to be shipped to Lulea, on the Gulf of Bothnia, on the one side, or to Narvik, in Norway, on the Atlantic. The shipping of the ironstone from Narvik has also made quite a town of that place, which used to be only a fishing village. A considerable revenue is derived by Norway from the Swedish ironstone shipped from this port, which, owing to the influence of the Gulf Stream, though in latitude 68° north, has always open water.

On the morning of 30th June we came in sight of the grand lake, Torneträsk, the river flowing from which, the Torneâ, forms the boundary

betwixt Russian Finland and Sweden, and flows into the Gulf of Bothnia betwixt the towns of Tornea (Finland) and Haparanda (Sweden). Torneträsk (pronounced Tornetresk) is a very large lake, some 43 miles long by 7 miles broad at its widest part. The mountains, still partly covered with snow at the end of June, rise to a good height to the west and north. On some of the mountains to the west, on the borders of Norway, the snow never melts away. We put up at a place called Abiskoyok, where the Swedish Touring Club has established several very nice wooden buildings with accommodation for one hundred visitors. This is now the centre of the Swedish National Park. We had been calculating on

A Lapp encampment.

fishing in the fine river below the huts, which flows into Lake Torneträsk, and in the lake itself, but we were informed that no sport of any sort was allowed for a certain number of miles on either side of the station, either in rivers or lakes. There are two railway stations on Lake Torneträsk, Abisko and Abiskoyok, the latter being the tourist station. One day we got the motor-boat belonging to the club and were taken up to the very top of the lake to visit a Lapp encampment in the stunted birch forest. Here we saw the Lapps, clothed in winter garments, though the temperature was over 100° in the sun. Those we saw did not look in the least Mongolian in feature, as some writers have stated. The women are ruddy in complexion, but the men and boys were colourless, probably from living so much in the smoke of their wigwams or tents. I tried fishing in the bays here for a short time, as it was beyond the limit of

the National Park, but without result. Judging from the Lapps' nets hanging up on the shores I suspected that the bays were all pretty well netted.

Beyond Abiskoyok, in the direction of Norway, the mountains come close to the lake, and the line leaves Lake Torneträsk, which trends away to the north, the intermediate land betwixt the railway and the lake being occupied by numerous small, shallow lakes or ponds connected by a shallow stream. These end at the boundary betwixt the two countries, at a station called Riksgränsen. For some distance beyond Riksgränsen the line begins to descend through a succession of tunnels,

Torneträsk.

the views of Norway to the north being of the most magnificent description. The line, to within a few miles of Narvik, runs alongside, but high above the long narrow Rombaken Fjord, a branch of the great Ofoten Fjord on which Narvik is situated. One was much struck with the change from the dark brown colour of the Sweden we had left to the beautiful green grass and birches alongside the Ofoten Fjord. The view, coming down the fjord, of the distant snow-capped mountains was superb and well worth coming so far to see. On the south-west side of the Ofoten Fjord lie the famous Lofoten (Lofoden) Islands, off the south end of which is the famous whirlpool of Mälström, locally known as the Mosköstrom. It is said to be caused by a strong current running past the small islands of Mosken, Väro, and Röst as the tides rise and fall: it is dangerous in the extreme to small vessels. To the north of the

Lofoten Isles, and almost touching them, are the Vesteraalen group, of which the Lofotens are just a continuation. Vessels going to the North Cape, which is only a day's sail distant, do not require to go out to sea, but run up the long narrow fjord betwixt the Vesteraalen Isles and the mainland of Norway. Norway is so narrow at Narvik that it scarcely takes an hour's journey to go from Riksgränsen there.

Narvik, formerly called Victoria Haven, before the railway from Lapland was constructed, has only sprung into importance since 1902, and now, as already stated, it has become a great port for the shipping of iron ore. There are said to be 4000 inhabitants. The shipping of the iron ore

Narvik.

goes on incessantly all through the daylight. One could scarcely sleep for the roar of the ironstone descending into the holds of the steamers. There are plenty of good shops, and everything necessary for the wants of a civilised community. The barbers' shops are run by young and comely Norwegian women, who cut hair better than any man can do for the modest sum of 50 öre (6½d.). Narvik lies at the foot of Fagernæs Mountain, about 4000 feet high, and close to, but beyond it, are two other mountains, Beisfjordtind (4400 feet) and Skomtind (4750 feet). We climbed the first of these in a little over two and a half hours. The climb is pretty stiff towards the summit, where there are many broken rocks. We reached the top a little before twelve o'clock and photographed the midnight sun as here shown (p. 84). The sun seemed to rest for a few minutes on the hills of the Vesteraalen Isles, and then gradually began to

rise. From the summit all round to the east and south-east there was nothing but high mountains, to a great extent covered with snow. Some of the snowfields were of great extent, and not likely ever to melt away, as winter in these regions begins in September. It seemed so strange to be walking down the mountain after twelve midnight with the sun's heat increasing every minute of the descent. By the time we got into the birch woods, near the base of the mountain, the mosquitoes became troublesome, and we were glad to get into the shelter of our hotel.

The Lapland of to-day is a very different place from the Lapland of even eight years ago, so fast do things move nowadays. The only thing

The Midnight Sun from Fagernæs.

to remind one of the far northern latitude is the stunted look of the trees—firs and birches—and the constant sight of snow on the mountains. Torneträsk and Narvik are splendid centres for Alpine climbers. The magnificent mountain, Kebnekaisse, the highest mountain in Sweden (7000 feet), and glaciers connected therewith would employ one at least a fortnight, and can be reached from Kiruna or Torneträsk (Abiskoyok). The peaks of the Lofoten or Vesteraalen Isles very much resemble the Cuchullins in Skye, and would furnish plenty of work for climbers. The climate in June and July is, as a rule, dry, and there is no night. A curious feature of the country here is the very strong wind that sets in from the north, or north-west, about 9 o'clock A.M. every day, and blows with more or less force till 6 o'clock P.M., when it completely dies away, though all the time the sky is cloudless.

A line may almost be drawn across Sweden from 100 miles north of Stockholm through Dalecarlia to the Norwegian boundary, south of which are the well-populated and cultivated parts. North of that line the severe cold of winter and the short summer will always hinder this part of Sweden from being well peopled, unless, of course, great discoveries of iron and coal are made.

Returning from the north to Stockholm we took the famous Göta Canal route to Lake Wetter through what is, perhaps, one of the loveliest and most English-looking parts of Sweden. The proper canal route crosses Lake Wetter from a place called Motala to Karlsborg, and thence

Perched blocks on Fagernæs.

to Lake Wener. From where we entered the canal proper in the east, after leaving the short sea portion at Arköesund in the Baltic to Lake Wetter, we might have been passing through Gloucestershire, there was such a lovely combination of cultivated land, with grand old oaks and elms, and fine country houses. Before reaching Lake Wetter, and after passing Norsholm, the canal route passes through the large lake, Roxen, and then through numerous locks and a small lake into another large lake, Boren. We then arrived at the town of Motala, an important manufacturing town, where, on the banks of the canal, in a prominent position, is the tomb of B. Von Platen, the engineer and constructor of the canal, who was advised by the great English engineer, Telford, in the building of it. There are numerous locks on this canal. I was informed that after November the water was run out, otherwise the ice would burst

the sides and cause endless expense in repairs. Motala is almost on the shores of Lake Wetter. From Motala we steamed down the east shore of the lake to Vadstena, where there is a fine, large and imposing castle, Vattersborg, surrounded by a moat. The castle of Vattersborg, built partly in Renaissance style by Gustavus Vasa in the sixteenth century, is not a fortress of any importance, and would be quite useless against artillery. Unfortunately, as it was late in the evening when we arrived there, we could not get admission to the interior, and had to content ourselves with walking round it. We arrived at Jönköping (pronounced Yonchipping) at 5 A.M. This is a large provincial town, with a popula-

Trollhätten.

tion of about 24,000, and occupies the whole south end of the lake. The only place of interest near Jönköping which we visited was Huskvarna, where there are great manufacturing works of fire-arms, sewing-machines, etc. These are worked by tremendous turbine power, the falls on the river being 160 feet in places. The scenery round the falls is beautiful, and many fenced-in walks have been made for the benefit of tourists. One of the sights of Jönköping is to go to the mouth of the breakwater and see the small local steamers go out. When a strong wind is blowing from the north or east it raises a perfectly mountainous sea outside, and as the steamers are usually crowded with passengers they must have a very unpleasant time of it. From Jönköping we went on through a beautiful country by the side of Lake Wetter to Falköping, which is a junction for the railway to Stockholm and Gothenburg, and numerous

other places betwixt Lakes Wetter and Wener. All the way from Falköping to Gothenburg the railway passes through a well-cultivated country with lovely lakes and woods.

With Gothenburg as headquarters, we visited the famous falls of Trollhätten on the river Göta, through which pour the waters of Lake Wener. The Trollhätten Falls are magnificent. It is almost impossible to describe the awful volume of whirling water which rushes down these falls. There are really four falls, 24, 27, 7, and 24 feet, and the amount of water falling is calculated to have a force of 220,000 horse-power. Gothenburg is a quite up-to-date town with a population of over 150,000. If any one wants a splendid view over the town and surroundings, he should ascend the outlook tower in the Glottskagen Park. The view from the top is one of the finest in Sweden. As Marstrand, one of Sweden's great watering-places, was only two and a half hours' sail west of Gothenburg, we took the Christiania steamer one day and visited it. Here were to be seen all the beauty and fashion of southern Sweden come to disport themselves during the long summer days. There are no sands or bathing-machines, deep water coming close up to the rocky shores, and the ladies and children bathe in large covered-in sheds. We made our way up to an old fort (Karlsten) which must have been a place of great strength in its day, but is now disused. From here there is a fine view, on a clear day, of the adjacent islands and the mainland of Sweden in the distance. It is a very up-to-date place, and well supplied with hotels and restaurants, sailing and rowing boats.

There is a great deal to be seen in Sweden, and, from the nature of its inhabitants, it is a very pleasant country to go about in. It would, however, take one more than one summer to get even a very ordinary knowledge of the country. English is not much known off the main routes, but with the aid of a good phrase-book it is not difficult to explain what you want. German seems more known than English.

THE NORTHERN LIMIT OF THE OLIVE IN THE FRENCH ALPS.[1]

As is well known, the olive is one of the most characteristic trees of the Mediterranean basin, and is one whose distribution has been always believed to correspond very closely with that of the typically Mediterranean climate. The tree has been the object of various detailed investigations, notably one by Professor Fischer,[2] who has studied its distribution in some detail. This investigation, like some other similar ones, was necessarily somewhat summary, in view of the amount of ground covered. M. Raoul Blanchard, Professor of Geography at the

[1] See an article by M. Raoul Blanchard in *La Géographie* for October 15 and November 15 last.

[2] See *Petermann's Mitteilungen, Ergänzungsheft*, 1904.

University of Grenoble, has therefore made a new study of a small part of the subject, in much greater detail. His results are graphically expressed in a very fine map, showing the exact distribution of the olive in the lower part of the Rhone valley, and eastwards to the Italian frontier at Ventimiglia. In his article he states that he has followed the northern limit of the tree in this region, step by step on the actual ground, in order to investigate the geographical significance of the facts. As the area studied includes, in Provence and the French Riviera, districts much visited by English-speaking people, a short summary of Professor Blanchard's results may prove of interest.

In the first place, he sets himself to examine the justification for the common assertion that the defile on the Rhone called the Robinet of Donzère marks the northern limit of the olive, and that, therefore, it is at this point (*i.e.* somewhat to the south of Montélimar) that the traveller from the north first enters the Mediterranean region. He finds that this statement has only a very generalised truth: there is no one spot in the lower Rhone valley where it can be said that temperate Europe ceases and the Mediterranean zone begins.

In the first place, there is a considerable difference between the right and left banks of the river. On the right there is no valley, for the calcareous cliffs approach the stream nearly, and such a limestone wall, running north and south, is not a suitable situation for Mediterranean plants. Sheltered nooks do, however, exist, and here the olive manages to keep a hold, even considerably north of Donzère. On the left bank it is true that no olives occur to the north of Donzère, but then their presence even there is altogether exceptional, and due to local conditions. They disappear on passing south of Donzère, and it is necessary to go far south, even beyond Avignon, before the olives cease to seek shelter from the cold winds, and venture boldly out on the plain. The inhabitants say that all this region of the Rhone valley is not the region of the olive, and often deny that the trees exist there, meaning that they are too few and the crop too uncertain to be of any practical importance.

On the other hand, as soon as we quit the wind-swept valley for the heights to the east, the olive becomes abundant, and round Nyons and Buis the groves, in which the trees are arranged in long rows, and are pruned to the same height, become the dominant note in the landscape. The important factor in this distribution is that the trees round Nyons and Buis find here the shelter, both from wind and from excessive moisture, which is so markedly lacking in the north-south Rhone valley, into which oceanic influences penetrate from the north.

Towards the mountains, on the other hand, shelter is obtainable, and the fact that most of the valleys have an east-west direction is especially favourable to the olive, which is abundant in the valleys of the rivers Eygues and Ouvèze, and is accompanied in these valleys by other Mediterranean plants. In detail one finds here all the usual features displayed by plants when near their natural limits of temperature. Thus the sunny sides of the valleys (*adret*) are favoured as compared with those facing north (*ubac*). Narrow valleys are unfavourable

because the sun penetrates with difficulty, and on account of frequent inversions of temperature the upper slopes of such valleys are more favourable than the lower, and so on. The most striking feature, however, is the flourishing appearance of the groves in the mountains, as compared with their appearance in the plain in the same latitude. The northern limit of these flourishing hillside groves is about the latitude of Donzère. In the valley of the Eygues and its tributaries the tree ascends to an altitude of 400-500 metres (1300-1600 feet), but in the Ouvèze valley it ascends even higher. A curious feature is the abundance of the tree in the long valley of the Toulourenc, which lies behind Mont Ventoux, and is thus separated from the Midi by the long crest of that mountain. This illustrates in a very striking way the importance of shelter.

Perhaps even more remarkable than the presence of the olive at the base of the north-eastern slope of Mont Ventoux, is its absence from the south-western slope, and this in spite of the legend that that mountain marks the northern limit of the Midi. In point of fact, to the south of the massif of Mont Ventoux the northern limit of the olive is pushed far to the south and west. The line which marks this limit runs southwards at the eastern end of Mont Ventoux, and does not again turn notably to the east till Lagnes is reached, a village only a few miles from Cavaillon.

The reason for this curious distribution is interesting. To the south of Mont Ventoux lies the calcareous plateau of St. Christol, which is joined to Mont Ventoux and its continuation eastwards—the mountain of Lure. This plateau, which attains a considerable elevation (over 3000 feet), is not sufficiently protected from the north wind by the chain in its rear, and owing to its petrological composition is not traversed by valleys. The water which falls on its surface sinks underground instead of flowing in river valleys, and reappears as springs at the periphery, the most interesting of these springs being the well-known Fontaine de Vaucluse. The absence of shelter and of valleys is very unfavourable to the growth of the olive, which thus only reappears at the margin of the plateau, and is pushed south and west by its presence.

Beyond Lagnes the northern limit of the olive runs eastward along the depression of Apt. Once the plateau of St. Christol is turned, the conditions again become favourable, and we find the trees ascending to the height of 800 metres (2600 feet) at Saumane, and reaching great luxuriance in the valley of the Durance. From its elbow at Mirabeau, indeed, the Durance is fringed by fine olive groves. This condition continues northward to Sisteron, where we have practically the northern limit for this valley. At Sisteron there is a fine "cluse" or gorge, which shuts off the sheltered valley of the lower Durance from the vast depression which that river, and its tributary the Buech, have hollowed out to the north. According to the inhabitants there is a marked difference in climate to the north and south of the defile. Actual proof of this is wanting, and isolated patches of olives do occur to the north of Sisteron, but generally it may be said that this point is the boundary between the Dauphiny and the Midi. Professor Blanchard, however,

prefers to say that while the defile prevents northern influences from extending further south, it permits some Mediterranean elements to find their way northwards.

From Sisteron to the Verdon the olive retreats steadily to the south, owing to the presence of relatively elevated mountains. But wherever favourable conditions are present, it pushes its way northward into the valleys, notably into those of the Bléone and its tributaries. In the lower part of the Bléone valley, however, though what seem to be exceptionally favourable conditions occur, the tree is very scantily represented. The reason seems to be economic rather than the result of natural conditions. The inhabitants find that such fruit-trees as pears and almonds are more profitable than olives, and therefore neglect the latter tree. In the upper part of the valley, round Digne, the tree reappears in abundance, and penetrates far into the mountains.

To the south of Digne the conditions alter suddenly. Here we have the vast plateau of Valensole, composed of Tertiary conglomerates, and hardly affected by the folding which is so prominent to the north. The plateau slopes from the west to the east, and is deeply channelled by numerous parallel consequent streams, which have eroded their valleys extensively in order to meet the Durance at base level. The drainage remains in the young stage, and many of the valleys are narrow and steep-sided; but on the other hand their favourable direction, from north-east to south-west, makes them warm and sunny. The plateau thus forms in every respect a marked contrast to that of St. Christol, and therefore, though its surface is devoid of olives, all its valleys are abundantly clothed with them. As Professor Blanchard says, every furrow which forms the merest scratch on the surface of the plateau is clothed with olives, the highest of which rise to the level of the plateau surface. The whole plateau is thus definitely Mediterranean, with its valley-slopes clothed with olives and vines and its valley-floors with fields and meadows. On the plateau above stretch fields of cereals, irrigated meadows, and rows of pear and almond trees, or of the truffle-oak. To the east, in the longitude of Moustiers, a sudden change occurs with the appearance of limestone mountains of greater elevation and steeper slope, traversed by narrow defiles instead of valleys, and with the change the olive disappears.

From the Verdon to the Var somewhat similar conditions prevail. Here we have on the one hand a calcareous plateau forming the margin of the Maritime Voralps, and on the other the depression of Lower Provence, consisting of soft marls, clays and schists. The calcareous mass has been unequally effected by folding. To the west the folds are few, while to the east they are numerous and complicated by faulting, which has enabled running water to carve the plateau into valleys. To the east, therefore, the olive is able to penetrate more deeply into the mountains than to the west, until in the gorges of the Loup and the Siagne near Grasse magnificent groves occur, the individual trees reaching a great size. Beyond Grasse the approach of the massif to the coast pushes the limit southward, until in the vicinity of the Var it approaches the coast so nearly that orange-trees, palms, and agaves mingle together

near the limit of the olive, so that several zones of vegetation are superimposed.

The system of the Var is complicated and dates from very different ages. The curious elbow on the Var itself speaks to the capture by a north-south river of an east-west stream, and some of the tributaries of the existing Var were once independent streams. The result has been to open out an extensive series of valleys, of which the olive takes abundant advantage. In detail the distribution in this series of valleys is determined by conditions of exposure to the sun and shelter from winds.

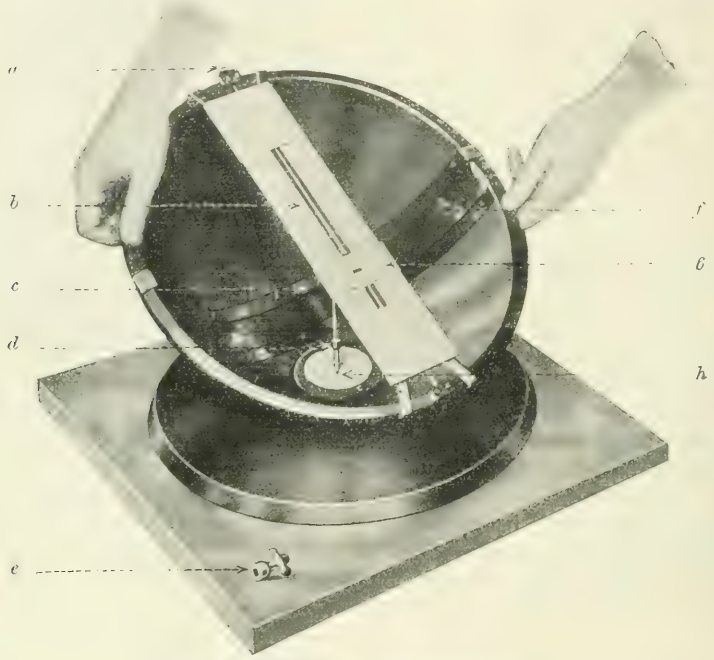
As to the general conclusions to be drawn from his survey Professor Blanchard states that in the French Alps soil counts for very little in connection with the distribution of the olive. Latitude again is unimportant, relatively speaking, for in the French Alps the northern limit varies within more than 60 miles of latitude in different localities. Nor is the limit a function of altitude. The tree rises to very varying altitudes in different localities, and the higher altitudes do not necessarily occur in the higher latitudes. The essential point is certainly the exposure. The favourable exposures are those to the south and east, or, to put the matter in another way, the tree must have shelter from north, north-east, and north-west winds. This in Professor Blanchard's opinion deprives the tree of any great geographical importance, as marking a climatic limit. It will not expose itself to any wind-swept region, while other Mediterranean plants which accompany it do not show the same sensitiveness. Thus on the plateau of St. Christol we have in the southern region a true Mediterranean "garigue," although the olive entirely avoids this plateau. Similarly the olive does not correspond to the Mediterranean climate in the strict sense, for the characteristic summer minimum of precipitation extends beyond the limit of the tree northwards, while on the other hand the olive extends into a region where there is a summer maximum.

HOMAN'S SOLAR CHRONOMETER.

(With Figure.)

Mr. William Homan, of 20 Renfrew Street, Glasgow, has been good enough to present to the Society a specimen of a very ingenious apparatus which he has invented, and named as above. It is designed to serve as a sundial, but to give the correction for the equation of time. The apparatus consists essentially of a hollow copper hemisphere fixed on a stand with a wire so placed as to represent the diameter of the sphere. In the equatorial belt of the hemisphere there is a fixed metal band graduated to represent the months and the days of the month, and below that a movable metal band, graduated on its upper edge, where it is in contact with the fixed metal band, to represent the months and days of the months, but with a different scale for the different months from the fixed band, and graduated in its lower part to represent the hours and minutes. The hemisphere is capable of a certain amount of move-

ment, so as to allow of each Chronometer being used within a certain range of latitude and longitude, and over the range within which it is used a small map at the bottom of the hemisphere serves as a means of adjustment for the precise spot in which it is intended to fix it. If this hemisphere were fixed so as to have the wire standing vertically, and its lower end were taken to represent the North Pole, then in this small map the North Pole would coincide with the lower end of the wire. A plummet is suspended by a thread from the middle of the wire, and



HOMAN'S SOLAR CHRONOMETER.

a Milled Straining Nut.
b Paper "Date-Declination Scale" (used for setting instrument between equator and 45°).
c Fixed Date Scale. *d* Plummet.
e Aluminium Key for clamping instrument in position.
f Movable Hour Scale. *g* Paper Slide. *h* Adjusting Map.

accordingly from the centre of the hemisphere. The hemisphere can be moved upon a horizontal axis as well as to some extent from side to side. It is obvious by this arrangement, that if the hemisphere is depressed on a horizontal axis, the plummet must hang in such a manner as to form an angle with the wire equal to the co-latitude of the spot over which it is suspended. The hemisphere can be slid so as to move it in longitude by the necessary amount, and the plummet will then hang precisely over the spot on the map at which the apparatus is to be set up. The wire will thus, by simply sliding the bowl until the plummet hangs above the correct place on the map, be in a position to

serve as the gnomon of a sundial showing standard sun time for the place in which it is set up. Then, the movable date scale being adjusted so that the date on which the apparatus is fixed coincides with the same date on the fixed date scale, the hemisphere must be turned upon a vertical axis until the shadow of the wire falls upon the hour as determined by an accurate watch. This being done, the Chronometer is now in a position to indicate the standard mean time, whenever the sliding hour scale is so placed that the current date on the date scale along its upper edge is opposite the same date on the fixed date scale. The apparatus may, therefore, now be permanently clamped in that position, and the map and the plummet having served their purpose in determining how the apparatus should be fixed, may be removed. This form of the apparatus is designed for use in the middle latitudes, say between 45° and 65°. A different arrangement is made when the Chronometer is to be used between the equator and 45° latitude. The apparatus is then so constructed that a watch is not necessary for the final adjustment. It will be obvious, in fact, on a little consideration, that in low latitudes the hemisphere cannot be turned on a vertical axis and be accurately placed by the use of a watch. In most respects the apparatus as designed for low latitudes is similar to that already described, and it is fixed for latitude and longitude in the same way. But for final adjustment to show the time there is a paper "date-declination scale." This scale, which is graduated for the months and the days of the months in proportion to the declination of the sun, stretches across the hemisphere from pole to pole, and has a slit in the middle immediately above the wire. On this paper date-scale there runs a paper slide, with a narrow transverse slit which has to be placed with reference to the paper date-scale exactly opposite the date on which the apparatus is to be fixed. This being done, and the hemisphere turned about a vertical axis, the slit allows of the shadow of the wire being thrown on the middle line of the movable hour-scale of the metal hemisphere only in two positions, one of which, when the movable date-scale is properly adjusted to the fixed date-scale, represents the standard time at the place, and the bearing in which the instrument should be permanently fixed is thus indicated. As the two positions are far apart, there can never be any doubt as to which is the correct one. The apparatus is now, therefore, in a position to be permanently fixed, and all the accessories, merely used for adjusting, may be removed as before.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Dr. H. A. Lorentz will describe his explorations in New Guinea before the Dundee, Aberdeen, Edinburgh, and Glasgow Centres on the 7th, 8th, 9th, and 10th of February respectively.

"A Journey Across South America from Bogota to Manaos" will be

the title of Dr. Hamilton Rice's lecture, which will be delivered before the Aberdeen, Dundee, Edinburgh, and Glasgow Centres on the 21st, 22nd, 23rd, and 24th of February respectively.

OBITUARY.

The Late Mr. S. H. Butcher, M.P.

A most distinguished man of letters, and a warm supporter of our Society, passed away when Mr. S. H. Butcher died on 5th January. He was born in Dublin on 16th April 1850, his father being the Bishop of Meath. Entering Trinity College, Cambridge, in 1869, he had a brilliant University career, and in 1878 was elected to a Fellowship of University College, Oxford. In 1882 he was appointed Professor of Greek in the University of Edinburgh, a chair which he resigned in 1903. In the lectures delivered by him at Harvard University in 1904 he discussed various geographical questions connected with ancient history. In 1908 he became M.P. for the University of Cambridge, a position which he held till his death. His University honours were many, he having received the honorary degree of LL.D. from the Universities of St. Andrews, Glasgow, and Edinburgh. When he died, he held the high office of President of the British Academy of Letters. He joined our Society in 1887, and becoming an Ordinary Member of Council in 1888 and a Trustee in 1898, he took an active part in the Society's work. His gracious presence, his kindly manner, and his hearty co-operation, will ever be remembered by those who administered with him the affairs of the Society. He was buried in the Dean Cemetery, Edinburgh. R. R.

GEOGRAPHICAL NOTES.

Europe.

The Burial of Olympus. — Under this title Mr. Ellsworth Huntington publishes a paper in the *Geographical Journal* for December last, in which he discusses the causation of the decay of Greece, as well as the narrower problem indicated in the title. The author believes that there is evidence in Greece of the same variations in climate within historic times as, according to him, have occurred in Asia and elsewhere (cf. p. 97). He believes that this view can be harmonised with the other view that the prevalence of malaria had much to do with the decay of Greece, for a small and variable rainfall promotes the formation of those temporary pools and masses of water, which are especially favourable to the breeding of mosquitoes.

Asia.

Mr. Carruthers' Expedition to North-West Mongolia.— Some further information has come to hand regarding the progress of

this expedition (cf. this *Magazine*, xxvi. p. 602), together with more details of the earlier work. We quote the following from an account which appears in the *Times*.

In crossing the Saiansk region, between the Yenisei and Lake Baikal, the party found that this region is covered by the dense forest called "taiga" by the Russians. This, no doubt, has been the hindrance that has stood in the way of previous explorers, and accounts for the poorness of the existing maps, the isolation of the country, and the seclusion of the nomad tribes which inhabit the more remote valleys of the upper Yenisei basin. The management of a heavy caravan of twenty-four horses through such a dense and trackless forest region was trying work, and progress was very slow. Eight miles a day was the average speed at the outset.

The route, which followed the Amil tributary of the Tuba river (right affluent of the Yenisei) and crossed the Saiansk divide by a low pass of 4524 feet, led on to the Sisti-kem tributary of the Bei-kem, the principal source of the Yenisei. From here a detour was made into the unknown country towards the north-east. The Chapsa tributary was explored up to its source, and the Saiansk divide was again crossed, and was found to reach an altitude of 4750 feet, with isolated groups of highlands reaching up to 7000 feet. The Mongolian side of this divide is a plateau, whilst the northern declivities drop quickly to the low Siberian plains. The Azaz and Chebush (Chebash) rivers were then followed down to their junction with the Kamsara and Bei-kem, and the densely-forested region between this river and the Khua-kem was in some measure explored.

The whole of the Upper Yenisei basin was found to be sparsely inhabited by tribes of Uriankhai, a race of Finno-Tartar stock of peculiarly small stature. A section of this race are "dwellers in the taiga" or reindeer-keepers, whilst the remainder live in the more open park-like country of larch groves and pasture land. The former are most interesting people, living in secluded valleys. Their lives are given up to hunting and herding their domesticated reindeer. On the tributaries of the Bei-kem, Uriankhai were met with who rely almost entirely on their herds of domesticated reindeer for their existence. These reindeer-keepers are only to be found in small, isolated encampments, in remote valleys amongst the dense "taiga." The reindeer are used both as baggage and riding animals, the tips of their horns being sawn off to facilitate their passage along the narrow forest paths. Their skins are used for making clothing, saddles, and various other necessities, whilst their meat and milk form their chief items of diet.

On the headwaters of the Chapsa river, where the bare tops of the Saiansk divide rise above the almost impenetrable forest, the existence of wild reindeer was proved, shed antlers being picked up and one wild specimen being seen. This animal was almost pure white, with short and massive horns. During the summer months the reindeer are exceedingly hard to find, living as they do on the upper edge of the timber, amongst cedar, abies, and rhododendron scrub. In the winter they go up on to the open hill-tops, which are blown clear of snow, and subsist chiefly on an abundant growth of reindeer moss.

The distribution of these reindeer extends from the upper Sisti-kem in the west along the Saiansk divide to the neighbourhood of Lake Kosogol. It would appear that the Saiansk reindeer might be compared to the woodland caribou of North America, whilst those of Northern Siberia take the place of the barren-ground caribou.

The western half of the basin was found to be very different from the upper or eastern half. Here are dry steppes with a Mongolian flora, and the natives live in felt tents, or "yurts," instead of "wigwams." The Kemchik region, as, indeed, the steppe country of the Ulu-kem, presents many signs of an ancient civilisation. Immense burial mounds stand in groups on the plains, those in one being surrounded by upright stone slabs. Carved stone images set upright in the ground, waist-deep, are another peculiarity. In the lower Ulu-kem valley are the still well-preserved traces of a great highway, running with Roman-like straightness and with well-metalled surface. In the forest regions no ancient remains were found.

From Cha-kul on the Ulu-kem the route led up the Chedan tributary of the Kemchik. This is an important and well-populated valley on the high road between Mongolia proper and the Siberian towns on the Yenisei. It possesses a large Buddhist Kurin, and is the residence of the hereditary noion, or chief, of this section of the Uriankhai. The expedition then crossed the Tanu-Ola mountains by the Borasha pass to the north-west of Ubsa-Nor, and passing along the southern foot of the range, explored the Saklia river up to its source. In the month of August the lakes of Uriu-Nor and Achit-Nor were visited. The former shows old strands at a height of 20 feet above the present level, and lagoons in various stages of desiccation between these strands. The absence of nomads was also remarkable, since an abundance of old burial-grounds show a once numerous population. The itinerary of the expedition then led by way of Suok, a Chinese guard-post under the Little Altai, to the Great Altai, which was crossed by the Urmogaitu pass, and the route followed the Kran valley to the Chinese settlement of Shara-Sume, or Tulta. The route led across the upper Black Irtish, north of Ulungur lake, and across the eastern Sair mountains to Chuguchak. Here the winter began to threaten and the expedition hurried on, after a two weeks' delay, to Kulja.

During this stage of the journey, they encountered the remarkable "Dzungarian gate" or "Gap." The Chuguchak plains, at an average height of from 700 feet to 1500 feet, which merge into the great steppes of Ala-Kul and Russian Turkestan, are bounded on the south by the Alatan and Barlik mountains, which rise to a height of from 9000 feet to 10,000 feet. Between these great mountain masses is the gorge or depression, by means of which the above-mentioned plains are connected with the deserts north of the main Tian-Shan range. At a distance it looks as if the Barlik and Ala-tan were one and the same mountain mass. On approaching the "Gap" that impression still remains, although it appears that some very ancient earth-movement has caused a great rift here.

If the waters that remain of the ancient Asiatic Mediterranean

(Balkash, Ala-Kul, Ebi-Nor, etc.) were to rise to a little over 1000 feet, they would flow right through the "Gap," flooding the plains to the north and south. This must actually have happened in the recent Quaternary period, and also in Tertiary times, when probably the sea was higher still. Deep deposits of fine mud, now carved out by streams into rolling downs, are to be seen on the north side of the Barlik mountains. These deposits, containing marine shells which will probably turn out to be Quaternary, rise to an altitude of a little over 3000 feet. Near the Barlik range there is abundant evidence of marine glaciation and of the *débris* dropped by icebergs in a frozen sea. On nearing the "Gap" the mud deposits begin to contain pebbles, false-bedded, showing that the currents and tides must have been strong.

The expedition reached Kulja on November 14. This year's programme is not quite settled, but a start was to be made in January along the Chinese trade route through Urumshi and Turfan to Hami.

Africa.

The Oasis of Kharga and Climatic Variation.—Mr. Ellsworth Huntington contributes to the *Bulletin* of the American Geographical Society a detailed study of the variations in the water-supply and population of the oasis of Kharga in historic times, with the object of settling the problem of whether or not marked climatic variation has occurred here.

The Kharga oasis, which can now be reached by railway, lies a hundred miles west of the Nile valley, in the latitude of Luxor, and is a depression in the Libyan plateau. It has been recently the object of a detailed investigation by Mr. Beadnell, of the Egyptian Geological Survey, and Mr. Huntington's discussion is based upon the facts furnished by Mr. Beadnell. The oasis is about 115 miles long from north to south, and 12-50 miles wide from east to west. To the east and north it is bounded by high and steep cliffs, varying from 600 to 1000 feet in height, but to the south and west it slopes gradually up to the desert. The floor of the depression is a large irregular plain lying from 100-400 feet above sea-level, over which are dotted the villages with their palm orchards and gardens. No natural springs nor streams occur, all the water necessary being supplied by artesian wells, which number 200-300, and are of very varied ages, some being 2000 or 3000 years old, while others have been dug recently. The population, which consists of Arabs, amounts to about 8500 persons, whose industry is agriculture, the land irrigated by the wells furnishing the food-supply. The area has been inhabited by man since palæolithic times, and Mr. Huntington takes the evidence furnished by Mr. Beadnell as to probable variations in population at different times, and, assuming that the water-supply must always have been the factor which had most influence on population, he endeavours to distinguish between periods when the water-supply was fairly abundant and those in which it was scanty. The discussion involves the consideration of many details which we cannot summarise here, but it is interesting

to note that Mr. Huntington finds a marked general correspondence between the periods of aridity at Kharga, and those which his previous work had led him to regard as periods of diminished rainfall in Central and Western Asia. The correspondence is so great as to confirm him in his opinion that great climatic changes have occurred within historic times over wide areas of the earth's surface.

America.

Biological Survey of the Panama Canal Zone.—Under the direction of the Smithsonian Institution a biological survey of this region is to be undertaken, the field parties being expected to begin work at an early date. In a memorandum upon the subject which was presented to President Taft, it was pointed out that a certain number of animals and plants in the streams on the Atlantic side of the Isthmus differ from those in the streams on the Pacific side, but the exact differences are not known, and it is important that they should be studied before the canal introduces the possibility of intermingling. Again, the Gatun Dam will create a vast freshwater lake, which will drive away or drown the majority of the animals and plants now inhabiting the locality, and may exterminate some species. It is, therefore, desirable that the flora and fauna should be studied before the lake is formed.

Polar.

Sir Ernest Shackleton's Plans.—It is announced that Sir Ernest Shackleton is contemplating an expedition to Spitsbergen in the coming spring, probably in the month of May. He proposes to spend about two and a half or three months in the region, and to undertake biological and geological research there. The party would consist of six persons, including Mr. J. Murray, the biologist, and other members of the *Nimrod* expedition.

Sir Ernest Shackleton has not made any definite plans at present for his next Antarctic expedition. After his return from Spitsbergen, however, he will probably proceed with his preparations for another visit to the Antarctic. He hopes that it will be possible for him to make a general circumnavigation of the Antarctic continent. Melbourne will probably be his base, and, if possible, he will have two ships and a party of about fifty men. He proposes to land three parties, each of nine men, at Cape Adair, Sabrina Land, and Enderby Land. These would form separate units, and each would have stores complete for two years. They would work inland over the great ice cap. The ships, in the meantime, would make their way round the continent, and would pick up the three parties at the end of a year or so, or, if necessary, two years. The ships would work from east to west with the wind and the tide.

Geological Excursion to Spitsbergen.—In connection with the Geological Congress held at Stockholm last summer, an excursion was arranged to Spitsbergen. In *Nature* for 1st December last, Mr. G. W.

Lamplugh gives an interesting account of this excursion, illustrated by some excellent photos. The most interesting of these is one showing the seaward face of Mount Capitolium, in Ekman Bay, which is built up of nearly level Carboniferous rocks, and is notched and fretted in the most striking way by gullies and talus cones. As Mr. Lamplugh points out, this is typical "bad land" topography, and the resemblance to parts of the bad lands of the western United States is strikingly shown by the illustration. The cause of this peculiar appearance—as in the United States—is the aridity of the climate, the insufficient precipitation in Spitsbergen preventing the formation of permanent streams, except where these are fed by melting ice and snow. The huge talus cones are the result of the action of frost, there being no permanent streams to carry away the *débris*.

The German Antarctic Expedition.—According to the *Times* the German Antarctic expedition, under the command of Lieutenant Filchner, will leave Germany early this year for Buenos Ayres, and will proceed from there at the beginning of October via South Georgia and the Sandwich Islands to the Weddell Sea. The route has been chosen so as to allow of oceanographical research on the way. On arrival in the Weddell Sea it is proposed to establish a base station on the eastern coast as far south as possible, with the necessary equipment for a year's research. A party of ten men will be landed, of whom six—a geologist, a meteorologist, an astronomer, a doctor who is also a biologist, a cook, and a sailor—will stay in the station, while the remaining four will undertake a long sledge expedition into the interior of the South Polar continent. Meanwhile the ship will return to the Atlantic Ocean to carry out coastal observations and oceanographical work.

The main geographical objects of the expedition are to determine the distribution of land and water, to establish the coastline of the Antarctic continent, and to study the conformation and direction of the ice. On the oceanographical side it is proposed to make systematic observations of the temperature, the salinity, and the oxygenation of the deep levels along certain lines in the Sargasso Sea, in the Brazilian current, and in high latitudes. Soundings will be taken on the Atlantic swell between latitudes zero and 10° N., where none are at present available. Further soundings will be made in the Argentine basin and further south. Observations with regard to ocean currents will be carried out from an anchored boat. The meteorological section of the expedition will be fully equipped with apparatus for registering air pressure, temperature, moisture, and wind, and magnetic observations will be made both at the base station and on the sledging expedition.

Exploration in Spitsbergen.—In a recent number of *Petermann's Mitteilungen*, Dr. H. Wichmann gives a brief summary of journeys in Spitsbergen up to the present time (*Binneneiswanderungen in Spitsbergen*). The paper is accompanied by a chart showing explorers' tracks from Nordenskjöld in 1873 to Lieut. W. Filchner in 1910. We note, however, a grave defect in this chart in the entire omission of Dr. W. S.

Bruce's work in Prince Charles Foreland in 1906, 1907, and 1909, the only tracks shown in the Foreland being some of Captain G. Isachsen. The seriousness of this omission is all the more apparent when it is remembered that it is due entirely to Dr. Bruce's expeditions that the Foreland has been mapped in great detail. Captain Isachsen's work, on the other hand, has been confined to the mainland, and his landings on the Foreland have no exploratory value as far as that island is concerned.

New Antarctic Expedition.—It is announced that Dr. Mawson, one of the members of Sir Ernest Shackleton's expedition, intends to start during the present year on an expedition to the Antarctic coastline. The area to be explored extends over about 2000 miles from Cape North on the east to the Gaussberg on the west. Special attention is to be given to meteorological work, as there is some prospect that the Australian Government may establish a meteorological station on the coast of the Antarctic continent, which would be connected by wireless telegraphy to both Australia and New Zealand. The party expect to be absent for at least eighteen months.

Commercial Geography.

Soda Deposits in East Africa.—According to an article in the *Times*, an attempt is to be made to work the soda deposits of Lake Magadi, in British East Africa, on the commercial scale. This lake, so-called, lies due north and south, between 1° 40′ and 2° south lat., and roughly upon the meridian 36° 17′ of east longitude. The southern extremity is about 15 miles from the frontier of German East Africa. The "lake" contains scarcely any water, except during the rainy season, and seems to consist of a solid mass of soda deposit. An analysis shows that the deposit contains about 43½ per cent. of sodium carbonate and 40 per cent. of sodium bicarbonate, and is singularly free from sodium sulphate, a fact which increases its commercial value. The area over which the deposit extends is about 30 square miles, and as the soda is removed from the surface a new crust is formed from the mother liquor. A bore hole has been put down to a depth of nine feet, and passed through a continuous mass of the deposit.

If the soda is worked, it is proposed to connect the "lake" with the Uganda railway, by a branch line, whose construction, it is said, presents no serious engineering difficulties, and which could be finished in two years. The railway would join the main line at or near Kiu or Sultan Hamoud, and a special port would be constructed at Kilindini.

EDUCATIONAL.

Last year we discussed here (vol. xxvi. p. 152) a paper by Professor Salisbury on the teaching of geography in the United States, the paper being based upon the results of a test given by him to a class of

students, and criticising severely modern methods of teaching geography. Recently, Mr. Douglas Wilson Johnson has forwarded to us a copy of a paper by him on the same subject, which appeared in the *Popular Educator* (vol. xxvii.). Mr. Johnson repeated with a class of Harvard students the experiment made by Professor Salisbury; that is, he gave a test which involved the naming of States, cities, rivers, etc., in the United States. In his paper he analyses the results obtained in some detail, but notes that, generally speaking, they were similar to those obtained by Professor Salisbury, and almost equally unsatisfactory. He diverges widely, however, from Professor Salisbury in his interpretation of the significance of these unsatisfactory results. In the first place he notes that, as was suggested in our comments here, the conditions make it difficult to ensure that the test is an absolutely fair one; much depends upon the legibility of the map, on the rapidity with which the questions are put, and so on. Further, in order to investigate the matter more fully, Mr. Johnson put a number of questions with the object of finding out the way in which the individual students' geographical information had been acquired. From the answers given to these questions, both by the students gaining good and those gaining low marks, he comes to the conclusion that the information possessed by college students does not, to any large degree, represent knowledge acquired in school. The greater part of the geographical knowledge possessed by students is acquired through travel, reading, and other outside sources. There is further evidence that the parrot knowledge acquired by memory drills of the older type is very rapidly lost. Mr. Johnson illustrates this point by a personal experience which many people can doubtless parallel. His own school teaching included under the heading of geography, the memorising of lists of the counties of the home State, with boundaries and county seats. He received high marks for this work, but found recently, in travelling in his native State, that he had forgotten practically all this laboriously acquired information, save in the few cases where personal knowledge had given vividness to the names. His conclusion is that "the best course in geography is the one which will rouse the interest of the greatest number of students, create in their minds a desire to learn more about things and places, make them alert to what is going on in the world about them, and teach them how and what to observe. . . . It seems to me that any movement to correct the deficiency in the average student's knowledge of geography by teaching more faithfully the things he does not know, would be a move in the wrong direction. The remedy should not be applied directly, but indirectly. The student who is required to master geographical facts, however important, may forget them before he has occasion to use them. But the student who has found geography an introduction to relations which stimulate his interest, as well as to the means of finding and using geographical materials, will correct his own deficiencies more effectively than could any course of study especially designed to supply valuable information." In other words, the teacher's prime object should be to arouse interest, not to impart information. In our opinion if he can do this, and, in

addition, can so train his pupil that the latter knows where and how to search for special information when he needs it, he has done all that can be asked of him. It is perhaps desirable to add, as Mr. Johnson does, in order to avoid misapprehension, that an intelligent interest in a subject is incompatible with entire ignorance of it, though it does not necessarily involve encyclopædic knowledge.

We have received two more packets of Messrs. Black's *Geographical Pictures*, those sent containing twelve views of river valleys, with descriptive text. We devoted a considerable amount of space to some of the earlier members of the series, so that it is hardly necessary to do more than call the attention of teachers to the new issue. As before, while the pictures seem to us very good, the text, perhaps partly because of the difficulties of condensation, is hardly equal to them in merit. We note that while Plate 7 is stated on the plate to represent the river Arfon, the text, doubtless correctly, states that it shows the Irfon, near its junction with the Wye. In the list of books which may be consulted also, we note Lord Avebury's *Scenery of Scotland*. Is this a misprint for *Scenery of Switzerland*? The treatment of valleys in general in the text seems to us rather inadequate, though no doubt it is difficult to discuss the subject in very small space.

NEW BOOKS.

EUROPE.

Canoeing and Camping Adventures: being an Account of Three Cruises in Northern Waters. By R. C. Anderson, F.R.G.S. Illustrated with Pen and Ink Sketches by G. C. Boulderson, and with Maps and Plans by the Author. London: C. Gilbert Wood, 1910. *Price* 3*s.* 6*d. net.*

This little book gives a brightly-written description of cruises in Scandinavia and the Gulf of Finland. The circumnavigation of Lake Wener, the third largest lake in Europe, was performed by the author and a friend in a 14 ft. home-made sailing canoe and a 10 ft. dinghy. The 260 odd miles of navigation, with delays for bad weather, were accomplished in twenty-six days. The second voyage, from Christiania to Stockholm, was undertaken in a two-masted 18 ft. Canadian canoe, with a crew of two. The route followed was down the Christiania Fjord to Fredrikshald, and thence by inland waters—the Tistedals Elf, and Lakes Wener, Hjelmar, and Mälar—to Stockholm; a distance of 480 miles, of which only 6½ were done by cart.

The third cruise, from Stockholm to St. Petersburg, in two small sailing canoes, was a more adventurous undertaking, involving the crossing of the Ålands Haf—the open sea between Sweden and the Åland Islands—and the navigation of the Skärgard, or archipelago of rocky islands along the northern coast of the Gulf of Finland.

The author speaks warmly of the kindness and hospitality shown them by the Swedes and Finns; the cooking and sleeping equipment of the expedition was, however, generally sufficient for the needs of the voyagers.

The book will no doubt be of considerable use to future small-boat sailers in these little-known waters, of which the author truly says, "There is little doubt

that these northern countries are the best in Europe for such voyages. Not only does the great extent of their inland waters make them peculiarly suited for Canadian canoe work, but their coasts also are unrivalled for small boat sailing."

The volume contains some graphic pen-and-ink drawings, and some useful notes on expenses, routes, and gear, will be found in the Appendix.

Unfrequented France by River and Mead and Town. By Miss Betham-Edwards. London : Chapman and Hall, 1910. *Price* 10*s.* 6*d. net.*

To readers of Miss Betham-Edwards' *Home Life in France*, and *Literary Rambles in France*, her name on the title-page of this her latest venture into the field of French travel will be a sufficient recommendation ; and we may add that those who go with her on her journey through unfrequented France will not be disappointed. Part of the ground covered is, we think, the same as in the *Literary Rambles*, but there is always something fresh to say about the pleasant land of France. We wonder how many of her English readers have ever visited Provins, the ancient city of the Brie and Champagne, though it is but sixty miles from Paris. Its many ancient monuments are well worth a visit. Or how many travellers, when the train whisks them through the Côte d'Or, and past Dijon, on their way to Switzerland or the Riviera, are aware what beauty spots there are for the seeker in this fair Burgundian country? With Miss Edwards for a guide they may learn where to look and find it worth a visit in the passing. From Dijon, Miss Edwards zigzags to Auxonne, the fortified town which, as she points out, defied the attacks of the Prussians in 1870-71, and in which the first Napoleon spent some years as cadet. Then on to Besançon, over whose surroundings she waxes eloquent, but we must refer the reader to the book itself for an account of an idyllic neighbourhood.

"Through the Jura" is the text for two attractive chapters, and the author recalls the fact that she wrote in 1880 to the effect that travelling in the Jura would one day become the fashion for English tourists ; a forecast which has not yet been realised. Miss Edwards' account of her journey by river from Lyons to Avignon, in the midst of summer, is enough to make one long to follow her example and take the trip down the Rhone, which she declares is finer than either the Rhine or the Danube. Another river excursion down the Tarn brings her to Montpellier-le-Vieux, and the wonderful rock-carved Cité du Diable. "Round about Clermont-Ferrand," and notes on the Nantes, Angevin, and Vendean country, go to make up a delightful volume which we can heartily recommend to all who are interested in unfrequented France.

The South Devon and Dorset Coast. By Sidney Heath. London : T. Fisher Unwin, 1910. *Price* 6*s. net.*

The South Devon and Dorset coastal tract of England is second to none in interest to all classes of students, and the publishers of the *Country Coast Series* have been fortunate in finding in Mr. Sidney Heath an accomplished writer who is well qualified to deal with the subject. He has made himself acquainted with much of the literature, of which it has been the inspiration ; he is well versed in its history, of which it is enough to remind our readers that it is concerned prominently with the stirring days of the Armada, the Commonwealth, the Restoration, the Revolution, and Napoleon Buonaparte ; he speaks with authority on architecture, of which there are numerous examples, varying from ancient churches to elaborate mansions and castles ; he discourses with great enthusiasm on the literary celebrities such as Jane Austen and Thomas Hardy ; and he is eloquent

in depicting the natural beauties of landscape and seascape. It is, indeed, true that "these wooded vales, grassy downs, and sunlit shores formed the arena on which our forefathers fought long and keenly, first, for personal and afterwards for national existence, and were the scenes of far-reaching social and political changes." Mr. Sidney Heath is an excellent cicerone in whose hands the varied interest of the story does not flag. The volume is well illustrated with photographs and sketches.

Hungary. Published by order of the Royal Hungarian Minister of Commerce. Edited for the Royal Hungarian State Railways by Albert Kain. Budapest, 1910. *Price* £2, 10*s.*

This magnificent volume has been issued by the Hungarian State Railways in the English language "in order to acquaint foreign nations with the natural beauties and cultural conditions, with the people and social life of Hungary, and with a view to inviting the educated classes of foreign countries who indulge in travel to pay us a visit, and to introducing to their notice the conveniences of travel and the comfort that is here at their disposal." Few who receive this invitation will fail to desire to accept it after perusing the finely reproduced photographs by Erdelyi which adorn every page of this remarkable work. The letterpress is by twelve Hungarians of note, and evinces that patriotic devotion to his country which is characteristic of every true Hungarian. As the writer of this notice can testify, the photographs of Budapest in this volume, while bringing out adequately the details of its many splendid buildings, cannot give any idea of the majestic appearance of the city, with the Danube flowing through its midst, and the ancient Buda sitting enthroned on a rocky height beyond. There is probably no city in the world with a more impressive site. Nor need the authors of this volume think that Hungary is not known in our country, at least by name and fame, for their great compatriot, Louis Kossuth, passed like a meteor across our Scottish sky in 1851, and was everywhere received with enthusiasm similar to that which afterwards greeted Garibaldi. In the volume before us are photographs of various monuments erected to Kossuth. We should have expected also one to Jokai, whose romances have stirred many a Scottish heart. The wide scope of the volume may be judged from the fact that, besides an introductory chapter on the geography, ethnography, and history of Hungary and a special one on Budapest, it describes the Hungarian Lowlands (Alföld), Western Hungary, the Western, Central, and North-Eastern Carpathians, and the Seaboard of Hungary. It is printed on fine paper in large clear type at the "Printing office of the Franklin Society, Budapest."

Mentone and Its Neighbourhood: the Past and the Present. By Dr. George Müller. Edited by Rev. J. E. Somerville, B.D. London: Hodder and Stoughton, 1910. *Price* 12*s.*

As both the authors of this work resided at Mentone for over a score of years and both were highly qualified to describe it, the volume is one of the most important which has appeared on this favourite Riviera resort. Dr. Müller, who was a cousin of Professor Max Müller, died in 1891, leaving a MS. account of Mentone and the surrounding district which contained the result of his thirty years' long research and observation. Mr. Somerville, the well-known Scottish clergyman at Mentone, has rescued this MS. from oblivion, and has carefully edited it with several archæological additions of his own. We have here detailed descriptions of Mentone as it is and as it was, with chapters on its environs,

including Cap Martin, Castellar, St. Agnes, Carnoulès, Monaco, Monte Carlo, Gorbio, Roccabruna, Peglia, Eze, Castiglione, Turbie, Vigilia, Beaulieu, and Villafranca, The Annunciata, Laghet, Grimaldi, and Ventimiglia. The caves near Mentone, called Rochers Rouges, were described by Mr. Richardson in this *Magazine* in 1903 after an excursion taken in company with Mr. Somerville, who asks in this volume, in reference to the skeletons having a distinct negroid face with marked prognathism, discovered in the Grotte des Enfants:—"Did a negro race inhabit these shores, and when? A whole series of great problems here awaits solution. A very strong element in the discussion of the problem lies in the fact that in the other cave which the Prince of Monaco has explored, cave No. 9, in about the same level, have been found the bones of the Central African hippopotamus. How did it come to be on the north side of the Mediterranean? Was it contemporaneous with the negroid race? Was it here before the Mediterranean Sea existed? or was there a connection across the sea with the African coast? The Prince of Monaco, who is deeply interested in the problem, has conducted soundings between the mainland and Corsica to try to discover a possible passage, but none such has been found; indeed, the depth is very great all the way." Mr. Somerville also contributes valuable articles on the Ligurian Forts and the Roman Road, so that future visitors to Mentone will, with the aid of this volume, find much scope for intellectual research and speculation, as well as deriving benefit from this well-known health resort. The volume contains many excellent illustrations and a useful bibliography, but no map. An archæological one would have been prized.

ASIA.

Rare Days in Japan. By George Turnbull Ladd, LL.D. London: Longmans, Green and Co., 1910. *Price* 10*s.* 6*d. net.*

Professor Ladd, who is an American educationalist, made three visits to Japan in connection with work on behalf of the educational interests of the nation. He is much in sympathy with the people, of whom he appears to have formed a very high opinion, and he was received on every hand as an honoured guest. He tells of three audiences which he had with the Emperor, at the last of which he was especially thanked for the work he had accomplished "for the moral education of the youth of the country." A certain allowance may perhaps be made for bias, in the case of a writer who was treated so handsomely, but the book is one of real interest. In his opening chapter Prof. Ladd gives an account of his visit to a session of the Imperial Diet, and his study of the working of the constitution leads him to the conclusion that the one fault which threatens the cause of parliamentary government in Japan is "a certain inability to avoid the evils of an extreme partisanship and to learn the art of practical compromises"; a conclusion which perhaps applies as well to parliamentary institutions nearer home.

Prof. Ladd's account of his experiences during the course of his own special work as lecturer and inspector of schools is worthy of note; particularly as regards the inculcation by the native teachers of the spirit called "Bushido," the appeal to pride and love of country, "prolonged from the Kindergarten to the University," with a view to producing good citizens. The chapter on "Ikegami and Buddhism" tells of a visit to the Nichiren Buddhist College, where the author delivered a lecture to some two hundred young priests and theological students on "The personal qualifications for a Minister of Religion," which, he says, was "in no important respect different from that which would be suitable for an audience of theological students in England or the United States," nor did its reception and

appropriation seem any less thorough and sincere. Prof. Ladd speaks in high terms of the training which has been given to the young temple boys at this Buddhist College, and it is significant of the changes which are taking place amongst the Japanese to learn that the various sects of Buddhism "are adapting themselves to the exigencies and expediencies of modern times," while a committee composed of Buddhists and members of the Young Men's Christian Association actually met at Nagoya, the Mecca of Buddhism in Japan, to arrange for a course of lectures on Education and Ethics!

Considerations of space prevent us from referring at length to the account of the various forms of the drama, and of the "Nō," or miracle play, and to other matters touched upon, but we can recommend Prof. Ladd's book as a picture of certain sides of Japanese life which are seldom described by others. The illustrations are from photographs, of which perhaps the most beautiful and suggestive is that of the school at Hiro Maru, standing in its own grounds overlooking the bay called Nagi, or "The Peaceful."

The Glory of the Shia World: The Tale of a Pilgrimage. Translated and Printed from a Persian Manuscript. By Major P. M. Sykes, C.M.G., H.B.M. Consul-General, and Agent to the Government of India in Khorasan, etc., assisted by Khan Bahadur Ahmad Din Khan. London: Macmillan and Co., Limited, 1910. *Price* 10*s. net.*

This is the autobiography of a Persian gentleman, and it reminds one irresistibly of an Oriental Brigadier Gerard. The unconscious vanity of the author is deliciously naïve and altogether forgivable. His pride in relating incidents bearing upon the well-known "slimness" of Persian officials is so unaffected that one cannot help laughing with him as well as smiling at him. His famous pilgrimage to Meshed might, from the indefiniteness of the description, have been performed in the days of Harun-al-Rashid, "may the curse of Allah be on him!" Major Sykes is to be congratulated on having in his translation preserved the traditional flavour to which all lovers of the "Arabian Nights" are accustomed. It is really a delight once more to read those quaint epithets and set phrases. Some of the numerous illustrations are reproductions in colour of Persian pictures, and these are wonderfully suggestive of the gorgeousness of the East.

POLAR.

Le Pourquoi-Pas? dans l'Antarctique. Journal de la Deuxième Expédition au Pôle Sud, 1908-1910. Par le Dr. Jean Charcot. Paris: Flammarion, 1910. *Prix* 15 *francs.*

In this volume Dr. Charcot tells most graphically the story of the cruise of the *Pourquoi-Pas?* and her explorations on the western side of Graham Land, and he has contrived, despite his adoption of the diary form of narrative, to write a story that is eminently readable from cover to cover. With his main geographical results readers of this *Magazine* are already familiar (*see* vol. xxvii. p. 38). We notice that the southern continuation of Terre Loubet has been named Terre Fallières, and that the new land beyond has been christened Terre Charcot.

Apparently Dr. Charcot's earliest intention, on planning this second expedition, was to make his base in Victoria Land and thence proceed southward. This project he abandoned when Britain returned to her special sphere of antarctic exploration, and at the same time he decided wisely not to compete for the Pole. Dr. Charcot has done so excellently in his continuance of the work of the *Français* that it

would have been a pity had he allowed the lure of the Pole to divert his attention from scientific work. Motor sledges were taken with the hope of penetrating some distance into the interior of Antarctica, but no surfaces suitable for their utilisation were found. In the matter of landings, indeed, Dr. Charcot was unfortunate, though he contrived to get his ship aground off Cape Tuxen, Graham Land—an accident which nearly proved disastrous. In fact so badly damaged was the ship below the water line that we must admire Dr. Charcot's pluck in undertaking a long southern voyage during the second summer.

There is much interesting information in the volume about Deception Island and the whaling industry that now centres there. These whalers, chiefly Chilian and Norwegian, were of great service to the expedition in many ways, and their presence in these waters will, no doubt, be of material assistance to many future expeditions.

It is of interest to note that no signs were found of the southern fur-seal which presumably is now extinct in Antarctic waters. The Ross seal was rarely seen, and the *Pourquoi-Pas?* has been no more successful than other expeditions in finding the breeding grounds either of that rare species or of the sea leopard. The Weddell and crab-eating seals were common, but we wonder on what grounds Dr. Charcot gives the latter species the alternative name of Dumont d'Urville's seal. The ringed penguin was found in great numbers nesting at Deception Island, and among them a few hundred macaroni penguins. Towards the south the ringed penguin became very rare. We look forward to further observations on penguins and other birds made by this expedition.

The cost of the expedition seems to have been some £32,000, of which about half was spent on the ship—a vessel of much the same size and build as the *Scotia*. Scotsmen should note that the French Government gave over £25,000 as well as 250 tons of coal and also the requisite instruments and charts.

One or two points call for correction. Weddell (p. 3) was not an "anglais"; Coats Land (p. 4) is misspelt, and so is the first word of Sven Foyn's name on p. 36. But the gravest mistake of all is the absence of an index: it seriously mars the usefulness of this delightful volume. The illustrations are fine, and there are several maps.

BOOKS RECEIVED.

Die Vegetation der Erde: die Pflanzenwelt Afrikas ins besondere seiner tropischen Gebiete. Von A. Engler. Hälfte 1 and 2. Demy 8vo. Pp., Hälfte 1, xxviii + 478; Hälfte 2, xl + 1028. *Preis* 60 *m.* Leipzig, 1910.

Mediæval Sicily: Aspects of Life and Art in the Middle Ages. By Cecilia Waern. 4to. Pp. xxxii + 354. *Price* 12*s.* 6*d. net.* London: Duckworth and Co., 1910.

Whitaker's Peerage, Baronetage, Knightage, and Companionage for the Year 1911. Pp. xvi + 812. *Price* 5*s.* London: Whitaker and Sons, 1910.

Whitaker's Almanack for 1911. By Joseph Whitaker, F.S.A. Pp. vii + 971. *Price* 2*s.* 6*d.* London: Whitaker and Sons, 1910.

Hazell's Annual for 1911: *A Record of the Men and Movements of the Time.* Edited by Hammond Hall. Twenty-sixth year of issue. Pp. lvii + 592. *Price* 3*s.* 6*d. net.* London: Hazell, Watson and Viney, Ltd., 1911.

From Hausaland to Egypt Through the Sudan. By H. Karl W. Kumm, Ph.D. Illustrated. Royal 8vo. Pp. xi + 324. *Price* 16*s. net.* London: Constable and Co., Ltd., 1910.

Au Brésil. Du Rio São Francisco à l'Amazone. Cent cinq Illustrations et treize Cartes. Demy 8vo. Pp. 464. *Prix* 10 *fr.* Paris: E. Guilmoto, 1910.

Nigeria and its Tin Fields. By ALBERT F. CALVERT. Cr. 8vo. Pp. xvi + 188. *Price* 3*s.* 6*d.* London: Edward Stanford, 1910.

Manual of the Natural History, Geology, and Physics of Greenland and the Neighbouring Regions. Edited by Professor T. RUPERT JONES, F.R.S., F.G.S. Demy 8vo. Pp. vi + 783. *Price* 13*s.* 6*d.* London: John Murray, 1875.

Storm Van's Gravesande: The Rise of British Guiana. By C. A. HARRIS, C.B., C.M.G., and J. A. J. DE VILLIERS. 2 vols. Demy 8vo. Pp. vol. i. 372; vol. ii. 373-703. London: Hakluyt Society, 1911.

Physical Geography for Schools. By BERNARD SMITH, M.A., F.G.S. Demy 8vo. Pp. viii + 190. *Price* 3*s.* 6*d.* London: Adam and Charles Black, 1911.

Egypt as we knew It. By E. L. BUTCHER. Cr. 8vo. Pp. vii + 227. *Price* 5*s. net.* London: Mills and Boon, Ltd., 1911.

Amurath to Amurath. By GERTRUDE LOWTHIAN BELL. Illustrated. Demy 8vo. Pp. xvii + 370. *Price* 16*s. net.* London: Wm. Heinemann, 1911.

The Building of the British Isles: being a History of the Construction and Geographical Evolution of the British Region. By A. J. JUKES-BROWNE, B.A., F.R.S., F.G.S. Third Edition. Demy 8vo. Pp. xvi + 470. *Price* 12*s. net.* London: Edward Stanford, 1911.

Regilding the Crescent. By F. G. AFLALO. With 24 Illustrations from Photographs and a Map. Demy 8vo. Pp. xii + 310. *Price* 10*s.* 6*d. net.* London: Martin Secker, 1911.

Elementary Regional Geography. By FREDERICK MORT, M.A., B.Sc., F.G.S. With Maps and Diagrams. Cr. 8vo. Pp. 192. *Price* 1*s.* Edinburgh: Oliver and Boyd, 1911.

A Regional Geography for Intermediate Classes. By FREDERICK MORT, M.A., B.Sc., F.G.S. With Maps and Diagrams. Cr. 8vo. Pp. viii + 280. *Price* 1*s.* 9*d.* Edinburgh: Oliver and Boyd, 1910.

Guide to Italy and Sicily. With 19 Maps and 36 Plans. Sixth Edition. Cr. 8vo. Pp. cxxviii + 394. *Price* 10*s. net.* London: Macmillan and Co., Ltd., 1911.

A Roman Frontier Post and its People: The Fort of Newstead in the Parish of Melrose. By JAMES CURLE, F.S.A. Scot., F.S.A. With Plans, and upwards of 1350 Illustrations. Demy 4to. Pp. xiv + 431. *Price* 42*s. net.* Glasgow: James Maclehose and Sons, 1911.

Central Provinces District Gazetteer: Raipur District. Vol. A. Descriptive. Edited by A. E. NELSON, I.C.S. Pp. xxi + 351. Bombay, 1909.

District Gazetteers of the United Provinces of Agra and Oudh. Vol. xix. *Cawnpore*; vol. xxii. *Haminpur*; vol. xxv. *Jalaun.* Allahabad, 1909.

Gazetteer of the Province of Sind. Vol. A. Compiled by E. H. AITKEN. Karachi, 1907.

Bengal District Gazetteers: Birbhum (vol. xix.); *Singhbhum, Saraikela, and Kharsawan* (vol. xx.). By L. S. S. O'MALLEY. Calcutta, 1910.

Punjab States Gazetteer. Vol. xxii. A. *Chamba State,* with maps, 1904. Lahore, 1910.

Punjab District Gazetteers. Vol. xxxii. A. *Jhang District,* with maps, 1909; vol. xxxiv. A. *Muzaffargarh District,* with maps, 1908. Lahore 1910.

The Tokyo Imperial University Calendar, 2569-70 (1909-1910). Tokyo: University, 1910.

Résumé Statistique de l'Empire du Japon, 24e Année. Tokio: De Meiji, 1910.

Papers and Reports Relating to Minerals and Mining, 1910. Wellington, 1910.

Board of Trade Reports: Iron and Steel, 1908-9. London, 1910.

The Geology of the Neighbourhood of Edinburgh. (Sheet 32, with Part of 31.) Second Edition. By B. N. Peach, LL.D., F.R.S., and Others. Demy 8vo. Pp. xii + 445. *Price* 7*s.* 6*d. net.* Edinburgh, 1910.

The Geology of East Lothian, including Parts of the Counties of Edinburgh and Berwick. (Explanation of Sheet 33, with Parts of 34 and 41.) Second Edition. Revised and re-written by C. T. Clough, M.A., and Others. Demy 8vo. Pp. x + 225. *Price* 4*s.* 6*d. net.* Edinburgh, 1910.

The Geology of Glenelg, Lochalsh, and South-East Part of Skye. (Explanation of one-inch map 71.) By B. N. Peach, LL.D., F.R.S., and Others. Demy 8vo. Pp. x + 206. *Price* 3*s.* 6*d. net.* Edinburgh.

Das Abflussgebiet des Nils. Von Dr. Walter Pietsch. Pp. 113. Berlin: Emil Ebening, 1910.

Diplomatic and Consular Reports.—Trade of Crete, 1909 (4603); Trade of Khorasan, 1909-10 (4604); Trade and Finances of Republic of Uruguay, 1909 (4605); Trade of Bushire, March 22, 1909—March 21, 1910 (4606); Trade and Commerce of Philippine Islands, 1909 (4607); Trade and Commerce of Hodeidah District, 1905-09 (4608); Trade of Bulgaria, 1908-09 (4609); Trade of Switzerland, 1909 (4610), Trade and Commerce of Algeria, 1909 (4611); Trade of Martinique, 1909 (4612); Trade and Commerce of Port Said and Suez, 1909 (4613); Trade of the Province of Angola, 1909 (4614); Trade of Bangkok, 1909 (4615); Trade of Muscat, 1909-10 (4616); Trade and Commerce of Cartagena, 1909 (4617); Foreign Trade of Italy, 1909 (4618).

Colonial Report (Annual).—Jamaica, Report for 1909-10 (662).

Publishers forwarding books for review will greatly oblige by marking the **price** *in clear figures, especially in the case of foreign books.*

NEW MAPS AND ATLASES.

EUROPE.

ORDNANCE SURVEY OF SCOTLAND.—The following publications were issued from 1st to 30th November 1910:—

Two-mile Map (printed in colours and hills shown by layers, folded in cover, or flat in sheets).—Sheets 26, 27, 28, 30, 31, 32, 33, 34. Price—on paper 1s. 6d.; mounted on linen 2s.; mounted in sections 2s. 6d. each.

One-inch Map (third edition, engraved, in outline).—Sheets 85, 95. Price 1s. 6d. each. Third edition, printed in colours and folded in cover, or flat in sheets. *Rudha Hunish*, Sheet 90; *Inverbroom*, Sheet 92; *Gairloch*, Sheets 91, 100. Price—on paper 1s. 6d.; mounted on linen 2s.; mounted in sections 2s. 6d. each.

Six-inch and Larger Scale Maps.—Six-inch Maps (Revised). Quarter Sheets, with contours in blue. Price 1s. each. *Ayrshire.*—23 NW. With contours in black. Price 1s. each. *Ayrshire.*—(38 NW. and 38 SW.); 39 SE.; 42 NW.; (49A SW. and 55A NW.); 50 NW.; 55 NE.; 56 NE.

1 : 2500 Scale Maps (Revised), with Houses stippled, and with Areas. Price 3s. each. *Lanarkshire.*—Sheets XXXVII. 6, 7 ; XXXVIII. 5, 6, 10, 13 ; XL. 5.

Note.—There are no coloured editions of these Sheets, and the unrevised impressions have been withdrawn from sale.

ORDNANCE SURVEY OF SCOTLAND.—The following publications were issued from 1st to 31st December 1910 :—

Two-mile Map (printed in colours and hills shown by layers, folded in cover, or flat in sheets).—Sheets 24, 25, 29. Price—on paper 1s. 6d. ; mounted on linen 2s. ; mounted in sections 2s. 6d. each.

One-inch Map (third edition, engraved, with hills in brown or black).—Sheets 85, 95. Price 1s. 6d. each. Third edition, printed in colours and folded in cover, or flat in sheets. *Banff*, Sheet 96 ; *Ullapool*, Sheet 101. Price—on paper 1s. 6d. ; mounted on linen 2s. ; mounted in sections 2s. 6d. each.

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1 : 2500 Scale Maps (Revised), with Houses stippled, and with Areas. Price 3s. each. *Lanarkshire.*—Sheets XXI. 14, 15 ; XXVII. 2, 3, 4, 6, 7, 8, 10, 11, 12, 14, 15 ; XXXIV. 2 ; XXXVII. 4, 8 ; XXXVIII. 12, 16 ; XXXIX. 7, 8, 9, 10, 11, 12, 13, 14, 15 ; XLIII. 1, 2. Sheets XXI. 16 ; XXVII. 16 ; XXVIII. (1 and 5) ; XXXIV. (3 and 7). Price 1s. 6d. each.

Note.—There are no coloured editions of these Sheets, and the unrevised impressions have been withdrawn from sale.

GEOLOGICAL SURVEY OF SCOTLAND.—The following publications were issued from 1st to 31st December 1910 :—

Scale 1 : 63,360, or 1 inch to a mile.

Sheet 32, Edinburgh District, with sections, 1910.
„ 33, Haddington District, with sections, 1910.
„ 71, Glenelg and Broadford District, 1910.

Printed in colours. Price 2s. 6d. each sheet.

Presented by the Board of Agriculture and Fisheries.

These revised sheets, newly issued at the popular price of half-a-crown each, will, no doubt, be highly appreciated by teachers and students. Each map is accompanied by a descriptive memoir.

HISTORICAL WALL MAPS OF SCOTLAND.—Scotland in 1306, with inset of Scotland under David I. Scotland in 1603, with inset of Clans and Families of Scotland. Size 30 × 40 inches. Printed in colours. Price, mounted on cloth, rollers, and varnished, 5s. net each.

W. and A. K. Johnston, Limited, Edinburgh and London.

These maps are the first of a new series of wall maps illustrating English, Scottish, and Irish history. They are based on the maps of the Clarendon Press Historical Atlas by Mr. Reginald Lane Poole. The maps are clear and effective and well designed for teaching purposes.

ASIA.

CHINA, showing Railways, Telegraphs, and Treaty Ports. Scale 1 : 5,000,000, or about 80 miles to an inch. With Notes on Railways. 1910. Price 1s. 6d. net.

Geographical Section, General Staff, London.

INDIAN TEA DISTRICTS.—Taylor's Maps of the Tea Districts of Darjeeling, Terai, Jalpaiguri, and Dooars, Darrang, Golaghat, Jorhat, Nowgong, Sibsagar, Lakhimpur, Dibrugarh, Cachar, and Sylhet. With complete Index to all Tea Gardens. 1910. Price 42s. net.

W. Thacker and Co., London and Calcutta.

These maps are on the scales of four and eight miles to an inch, according to extent of each district. They are designed simply to show the tea gardens and their connections by road and rail. The names of all tea gardens on the maps are printed in black, roadways are coloured in brown, rivers in blue, railway systems, railway stations and steamer ghat stations are all shown in red.

MONGOLIA.—Atlas Universel de Géographique par Vivien de Saint-Martin et F. Schrader. Asie en 10 feuilles.—Feuille iii. No. 48, Mongolie. Echelle de 1 : 5,000,000. 1910. Price 2 fr. *Hachette et Cie, Paris.*

An excellent new map of Mongolia compiled from the latest authorities.

AFRICA.

EGYPT AND EGYPTIAN SUDAN.—Atlas Universel par Vivien de Saint-Martin et F. Schrader. Carte No. 67. Egypte et Soudan Egyptien. Echelle 1 : 5,000,000. 1910. Price 2 fr. *Hachette et Cie, Paris.*

KAMERUN.—Karte in 20 Blätter und 4 Ansatzstücken im Massstabe von 1 : 300,000 bearbeitet von Max Moisel. Im Auftrage und mit Unterstützung des Reichs-Kolonialamts. 1910. Blatt G 4, Baturi. Blatt H 4, Molundu. Price M. 2. each sheet. *Dietrich Reimer (Ernst Vohsen), Berlin.*

These are the first two sheets of a very fine new map of the Kamerun territory on the large scale of about five miles to an inch. Each sheet is accompanied by a printed list of all the material from which it is compiled. This work when completed will be a most valuable contribution to the mapping of Africa.

NORTHERN AND SOUTHERN NIGERIA.—Scale 1 : 2,000,000 or 32 miles to an inch. Compiled in the War Office. 1910. Price 3s. 6d. net.

Geographical Section, General Staff, London.

A very useful complete general map of Nigeria. The provinces and districts are shown in red, and tribal names in green.

AMERICA.

ONTARIO.—Standard Topographical Map. Scale 1 : 250,000 or about 4 miles to an inch. Gowganda Sheet (8 NE.). 1910.

Department of the Interior, Ottawa.

PRINCE EDWARD ISLAND.—Standard Topographical Map. Scale 1 : 250,000 or about 4 miles to an inch. Sheets 14 SW., 14 SE. and 15. 1910.

Department of the Interior, Ottawa.

ROCKY MOUNTAINS.—Between latitude 51° and 53°. Scale 1 : 253,440 or about 4 miles to an inch. Two sheets. 1910.

Department of the Interior, Ottawa.

WESTERN CANADA.—Scale 1 : 2,217,600 or 35 miles to an inch. Four sheets. R. E. Young, chief geographer. 1910.

Department of the Interior, Ottawa.

UNITED STATES GEOLOGIC ATLAS.—Santa Cruz Folio (California). Scale 1 : 125,000. Engineer Mountain Folio (Colorado), Accident-Grantsville Folio (Maryland), Franklin Furnace Folio (New Jersey). Scale 1 : 62,500. Trenton Folio (New Jersey), Watkins Glen, Cataconk Folio (New York), Jamestown, Town Folio (North Dakota). Scale 1 : 125,000. Mercersburg, Chambersburg Folio (Pennsylvania), Warren Folio (Pennsylvania), Philadelphia Folio (Pennsylvania). Scale 1 : 62,500. Aberdeen, Redfield Folio (South Dakota), Belle Fourchette Folio (South Dakota), El Paso Folio (Texas), Laramie, Sherman Folio (Wyoming). Scale 1 : 125,000. 1909-10. Price 25 cents each folio. Philadelphia Folio, 50 cents.

United States Geological Survey, Washington, D.C.

Each of these folios is a complete geological compendium of the area dealt with. It contains a contoured topographic map, an areal geology map, and a sheet of structure sections ; in some cases there is also an economic geology map, sheets of columnar sections, and reproductions of photo views illustrating special characteristics. These maps and illustrations are accompanied by very complete descriptive text.

AUSTRALIA.

QUEENSLAND.—Sketch Map of East Central Queensland Gold, Mineral and Coal Fields between Rockhampton, Gladstone, and the Dawson and Mackenzie rivers. Prepared at the Geological Survey Office, Department of Mines, by W. K. Greenfield. 1910. Scale 4 miles to an inch. Price 1s. 6d.

Geological Survey Office, Brisbane.

ATLASES, ETC.

GROSSER DEUTSCHER KOLONIAL-ATLAS.—Bearbeitet von Paul Sprigade und Max Moisel. Herausgegeben von Reichs-Kolonialamt. Lieferung 7, Deutsch-Ostafrika, No. 18, Kilimandscharo, (1 : 1,000,000) ; No. 22, Bismarckburg, (1 : 1,000,000). Die Deutschen Besitzungen im Stillen Ocean und Kiautschou, No. 30, Kiautschou und Samoa. 1910. Price M. 5.

Dietrich Reimer (Ernst Vohsen), Berlin.

This atlas is so systematically kept up to date that it has become an invaluable authority for the mapping of the German Colonial possessions.

HISTORICAL ATLAS.—Thirty-two Plates, printed in colours, containing 44 Maps and Plans, together with historical notes and a chronological table of national history. Index to Place-names. 1910. Price 1s. 6d. net.

W. and A. K. Johnston, Limited, Edinburgh and London.

This new issue of this useful little atlas has been re-modelled. It has also been revised on the basis of Mr. Reginald Lane Poole's Historical Atlas. The notes and chronological table are valuable additions.

BATHY-GEOGRAPHICAL MAP OF THE WORLD.—On Gull's Projection. Equatorial Scale 1 : 33,634,000. With inset Maps showing Mean Annual Temperature and Mean Annual Rainfall. Size 50 × 42 inches. Price, mounted on cloth, rollers, and varnished, 12s.

W. and A. K. Johnston, Limited, Edinburgh and London.

This last addition to Messrs. Johnston's new series of wall maps shows generally the height of land and depth over the surface of the globe. By a curious mistake Lake Chad and the surrounding country are represented as below sea-level.

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

THE SECOND FRENCH ANTARCTIC EXPEDITION.[1]

By Dr. J. B. Charcot.

(With Sketch-Map and Illustrations.)

In the great effort now being made in common for the conquest of the Antarctic, it is pleasant to notice on the one hand the complete accord manifested both by the leaders of expeditions and by the experts who have organised them, and on the other the truly scientific spirit which has animated them. It is to be hoped that the Antarctic campaign will continue to be characterised by such a state of things, which must redound to the advantage of science in general; and I am convinced that in our enlightened age the small amount of distinction which explorers can confer on their respective countries will not be found to suffer by it.

The exploration of the Antarctic has been set going, and the movement ought not to slacken until the conquest—still only just begun—is complete. Captain Scott has just set out once more for the final attack on the South Pole itself, and great expeditions are being talked of in Germany, Norway, and Japan, while the Argentine Republic is maintaining a permanent observatory in the South Orkneys, and means to establish another on the west coast of Graham Land—the site of our winter quarters. Already, in 1908, Sir Ernest Shackleton had achieved the daring and successful exploration which took him within 112 miles of the Pole, when we, on the *Pourquoi Pas?* were putting forth our best efforts—not indeed on a scale to bear comparison with his—in the region south-west of South America; and, thanks to the zeal and industry of my colleagues, were securing results which the learned world has done us the honour to think of value. I now wish to set forth

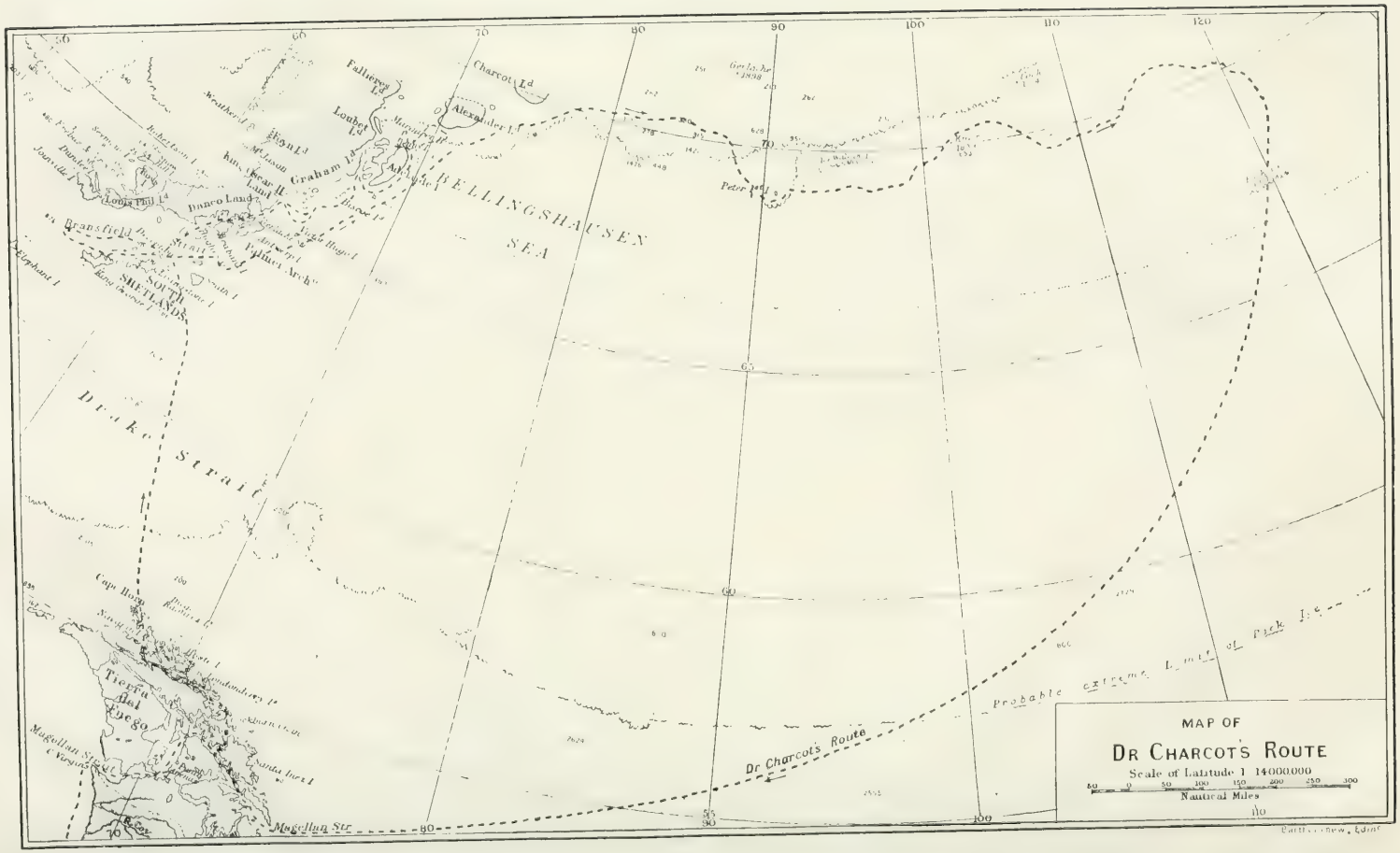
[1] An address delivered to the Society in Edinburgh on December 20, 1910.

a summary of those results, which will, I trust, show how important it is to continue the systematic exploration of the whole Antarctic area. But first I should explain the reasons which led me to choose for my field of action a region so inhospitable, often yielding but a poor return to the explorer, and situated at so great a distance from the Pole itself.

While running along a coastline with a trend to the southward, Ross discovered, in 1841, an immense vertical ice cliff running eastward, which has been known ever since as the Great Barrier. Borchgrevinck, in 1900, climbed this cliff, and found a plain of ice extending as far as the eye could reach. Finally, in 1902, the *Discovery* expedition, after following the barrier eastward, discovered King Edward VII. Land at its termination in that direction, and after wintering in Victoria Land, made a fine dash over the barrier as far as 82° 17′ S. It was perfectly natural that Sir E. Shackleton should return to this region, with the exploration of which his country had become so intimately connected, and it was equally natural, since he had announced his intention of so doing, that I should refrain from entering the same field, however tempting it might appear. In any case, two expeditions of different nationalities, with the best intentions and the best spirit in the world, would have of necessity been drawn into a competition for the attainment of the highest latitude possible, and however great the sporting interest of this might have been, it would have been to the absolute detriment of scientific work and perhaps even of any definite results at all. I feel bound to add with all sincerity that I do not believe we should have attained the magnificent result achieved by my friend Sir Ernest Shackleton, and the sacrifices made by my country would thus have been a pure loss.

The Antarctic is, besides, vast enough to permit many expeditions to work in it side by side with good results, and I decided to return to the region which I had begun to study in the *Français*, in 1903-5, continuing the labours of De Gerlache. My object—a thoroughly definite one—was to study from all points of view the greatest possible expanse of ground in the Antarctic without consideration of latitude. I knew that I was devoting my energies to the region in which the ice advances farthest northward, since it begins in 61°, and I had no hope of getting anywhere near the Pole. The Academy of Sciences, the Museum, and the Oceanographical Institute gave their support to the expedition; the French Government granted it a liberal subvention, which was reinforced by private subscriptions; and, lastly, a Committee of the Academy drew up for us a detailed programme of the work which it desired us to undertake.

I had built at St. Malo a three-masted barquentine with auxiliary steam power—the *Pourquoi Pas?*—and this was fitted out with care and supplied with the most up-to-date instruments for observing purposes. The crew of twenty-two was composed, in great part, of my old crew of the *Français*, which had shown great keenness to return with me, and the staff consisted of seven persons, whose functions were as follows: M. Bongrain, naval officer, was charged with the astronomical, pendulum and seismographical observations, and with the hydrographical work; M. Rouch, naval officer, with meteorology, atmospheric electricity, and


BELLINGSHAUSEN SEA
Drake Strait
SOUTH SHETLANDS
Tierra del Fuego
Magellan Str.
Dr Charcots Route
Probable extreme Limit of Pack Ice
MAP OF
DR CHARCOTS ROUTE
Scale of Latitude 1 14000000
Nautical Miles

physical oceanography; M. Godfroy, naval officer, with the tidal observations, coast hydrography, and chemistry of the atmosphere; M. Gourdon with geology and glaciology. MM. Liouville and Gain together undertook the zoology, and M. Senouque the magnetic, actinometric work and scientific photography. This mere enumeration will suffice to indicate the nature of the various labours successfully carried out by us.

We left Havre on August 15, 1908, and after touching at ports in Brazil and the Argentine, where we met with a cordial reception, we reached Punta Arenas on December 10. On the 16th we set out for the Antarctic, and a few days later arrived at Deception Island, where we filled our coal bunkers from the dépôt of the Sociedad Ballenera Magellanes, and where we began our labours. After gaining Port Lockroy, in Gerlache Strait, we, a few days later reached Wandel Island, where the *Français* wintered in 1904, and where we laid a dépôt of provisions. Thence we gained a harbour which we discovered in Petermann Island. A reconnoitring expedition, with a view to finding out whether navigation was possible between Biscoe Island and the coast, was very nearly fatal to three of us, who were, however, rescued by the *Pourquoi Pas?* When returning, the ship unfortunately ran aground, remaining fixed for three days, and springing so serious a leak forward that she subsequently made 48 tons of water per day. The expedition afterwards continued its voyage southward, filling in and extending the hydrography of the South American Antarctica which had been begun by the *Français*. We rediscovered the bay noted by Pendleton, and brought to light a large bay (Matha Bay) on the north side of Adelaide Island. This island has a length of 70 miles in place of the 8 which had previously been assigned to it. South of Adelaide we discovered Marguerite Bay, and, in spite of serious difficulties, were able to survey 120 miles of new lands in a southerly direction. After several attempts, we at last succeeded in reaching Alexander I. Land. Having ascertained the impossibility of wintering with a ship in this region, the expedition returned to Petermann Island, where the winter station was established at a spot which offered promising conditions for the scientific observations. During the autumn numerous extended excursions were undertaken over the glaciers and along the coast.

The winter, though very mild, was very trying, a constant gale blowing for nearly nine months from north-east to east-north-east. Several members of the party suffered from severe attacks of scurvy. In the spring an attempt was made to cross Graham Land, but it was impossible to surmount the perpendicular wall of granite and ice which seems to bound the whole region.

With great difficulty, by reason of the abundance of the ice from August onwards, the *Pourquoi Pas?* was able to reach Deception in December, and we met with a splendid reception from the whalers there, who supplied us with one hundred tons of coal. We carried out a number of interesting researches at this island, and then, prevented by the ice from reaching Joinville Island, visited Bridgeman Island, Admiralty Bay, and the south coast of the Shetlands. Once more turning southward, the *Pourquoi Pas?*

succeeded in passing all latitudes previously attained to the south-west of Alexander I. Land, continuing the survey of this, and discovering to the south-west a new land, which received the name Charcot. Following the edge of the icepack, we subsequently made the Island of Peter I., which we found to have been very correctly placed by Bellingshausen. Here we experienced a terrible hurricane. Afterwards, sailing between numerous icebergs and frequently within a very thick pack, we kept almost exactly on the 70th degree of south latitude until we reached the meridian of 124° west of Greenwich. The ice now became more abundant, the coal was exhausted, and the general health unsatisfactory, so that it was necessary to turn once more towards the north, and after ten days of somewhat eventful navigation, the expedition returned to Punta Arenas by Cape Pillar on February 12.

Our vessel proved an excellent one from all points of view, both in the ice and in the open sea, and we had not a single mishap with the machinery. To have stood what she did, her strength must be quite remarkable. The crew was splendid, and as to the staff, it was only through its incessant labour that the results of the mission were secured. The scientific programme was carried out with scrupulous exactitude. Some months will still be required to disentangle all the material furnished by this expedition—to study and put in order the rich collections brought back—and it is therefore difficult to give more than a dry *résumé* of the results obtained.

A number of detailed maps have been constructed with the greatest care by M. Bongrain, showing, besides the coastlines, the position of the soundings, the limits of the pack-ice, etc. Determinations of gravity were made at La Plata, at Punta Arenas, Deception Island, Wiencke Island, Petermann Island, and Jenny Island ; and it can already be said that the results show certain differences from the theoretic calculations. Eight months' observations at the winter station recorded two earthquakes, five seismic storms, and a great number of microseisms. Less extended observations were also made at Deception Island. Lastly, observations of the last contact during the solar eclipse of December 23, 1908, were made at Deception.

M. Gourdon was able to establish the fact that the same dioritic and granitic formations as are met with in Graham Land are found further south, and he was able to study the important volcanic formations of the South Shetlands. He also obtained proof that the main characters of the more northern regions persist in the newly explored area, particularly in Alexander I. Land and in the new lands to the south-west of this. The existence of a continental shelf is established by the numerous soundings effected during the voyage to the west, coupled with those of the *Belgica*. The various excursions carried out on the glaciers of Graham Land permitted their features to be laid down on the map, while, during the winter, observations on the freezing of the sea and the formation of the pack-ice were made.

M. Rouch's meteorological observations may be divided into two sections—those made at the winter station and those carried out during

the voyages in the ship. During the winter, two complete observatories of the first order, the one at sea-level, the other at an altitude of 100 feet, were kept regularly in working order. The observations were supplemented by determinations of soil temperature, by actinometric researches, and by series at different altitudes. All our observations can be compared with those made simultaneously at the observatories at Punta Arenas, Ushuaia, Staten Island, and the South Orkneys. M. Rouch was also able to register the amount of the potential gradient of the atmosphere for ten months. The working out of the observations reveals a well-marked annual variation with a minimum in June, and a single-period daily variation with minimum at about 4 A.M. These observations were supplemented by measurements of the electric conductivity of the atmosphere, showing that, in the mean, the conductivity is the exact inverse of the potential gradient.

The studies of physical oceanography include about 100 soundings. Two hundred samples of sea-water, at the surface and at various depths, were secured, in conjunction with temperature measurements. Twenty hauls of the tow-net were made at depths extending to 450 metres (246 fathoms) and one with the vertical net at a depth of 1000 metres (546 fathoms). The soundings reveal a continental platform with considerable variations of relief, and define its limits to the west. Towards the north they complete the work of Nordenskjöld, and to the south, that of De Gerlache. They prove the existence of a submarine gully 5000 metres (2700 fathoms) in depth, and a rise situated in 70° south and 119° west of Greenwich.

M. Godfroy observed the tides at the winter quarters during a period of 225 days, and at Deception Island during 18, with shorter series at various other points. From these observations it is already possible to conclude (1) that a perfect agreement exists between the amplitudes of the diurnal and semi-diurnal lunar-waves and those of Lord Kelvin's theory of the tides; (2) that the amount of the solar tides relatively to those of the moon is considerable; (3) that the tides of long period have a relatively high amplitude; (4) that an immediate effect of the variations of barometric pressure on the level of the sea is traceable, though this was apparently localised at the winter station. M. Godfroy also carried out the programme committed to him in regard to the taking of samples of air, and of the atmospheric precipitation—the latter with a view to the determination of the nitrous compounds and the amount of ammonia. He likewise made many plans of the different anchorages, and took a large number of soundings at the same places.

M. Senouque, whose task was the magnetic observations, carried out absolute determinations of the three elements of the magnetic field at six stations. During the winter, the variations of the elements were registered by photography, while on the first and fifteenth of each month high-speed records were taken simultaneously with those obtained at the Argentine observatories at the South Orkneys and Staten Island. The magnetic perturbations were very numerous, except in June and July. M. Senouque also devoted himself to the actinometric work, and a series of observations of solar radiation were made with Michelson's bimetallic-

plate actinometer. These observations have shown that the atmosphere of these regions is much more transparent than that of the temperate regions. The record showed 1·55 calorie at Deception (the sun having an elevation of 50°), whilst in the park of Saint Maur, even in summer, M. Moureaux has never found more than 1·16 calorie.

MM. Gain and Liouville have brought back the most complete collections in zoology and botany. They are at present being studied, and it is already possible to state that they include many novelties. Besides the marine collection, M. Gain secured specimens of all the birds seen. The embryonic collections include series of embryos of penguins at all stages, as well as of other birds. Some of the eggs could be hatched by means of the artifical incubator. By means of rings of different colours attached to the feet of penguins during the first summer, M. Gain was able to establish the fact that these birds return from year to year, not merely to the same rookery, but to the same position in the rookery, and that the young do not breed until two years old.

Many specimens of parasites, both external and internal, have been brought back. Fresh-water crustacea were found in great abundance in the pools resulting from the melting of the ice, the group best represented being the *Branchipodidæ*. M. Liouville collected many specimens in the field of pathological and comparative anatomy, derived from the seals. Embryos of the various species of these have been brought back, particularly those of the sea-leopard, which had not previously been seen by any naturalist. The *Cetacea* were studied by him, both living and dead, and many facts regarding them were collected at the whaling station at Deception Island. Lastly, we brought back for the Pasteur Institute a number of preparations and sealed tubes containing fæcal matter, soil, etc., which will be studied from the point of view of bacteriology.

From this succinct summary of our expedition it will be apparent that, if the relatively good conditions under which we spent the winter, despite the comparatively low latitude of the station, permitted us to carry out a very complete and systematic programme of scientific observations and researches, taken as a whole the undertaking was essentially a maritime one. Although it is impossible at present, while the experts who have interested themselves in our labours are still occupied in getting our collections and studies into order, to present any final results, I am nevertheless in a position to draw from them a series of deductions which may not only have their value for the geography and topography of the regions visited, but may also be of some use to explorers or navigators who may venture into these same localities in the future.

The recent great movement of whalers towards the Antarctic, which recalls the adventurous voyages of the sealers at the beginning of the nineteenth century (I have been assured by well-informed persons that there will be in the far south, during the present southern summer, eighteen vessels provided with oil-rendering plant), causes considerable importance to attach to the data regarding navigation, particularly in Bransfield Strait, but also in the northern part at least of Gerlache Strait. I therefore think it worth while to state briefly the points of interest we

The *Pourquoi Pas?* aground near Cape Tuxen, January 1909.

A living sea-leopard.

were able to ascertain in regard to these localities, either by our own survey or by inquiries among the Norwegian whalers whom we were fortunate enough to meet.

Navigation in Bransfield Strait seems never to be impeded by ice from November to March, at any rate in the northern and western portions; there are a few icebergs or ice-blocks scattered about and nothing more. On the contrary, in the southern and eastern portions there may be sea-ice in abundance, such as to prevent all navigation even by ships specially constructed to stand the shocks of the ice. I need hardly recall the fact that when in 1903 the *Antarctic* attempted to pick up Nordenskjöld, then wintering at Snow Hill, it was impossible, in spite of all the ice-craft of the intrepid Captain Larsen, for the vessel to cross Antarctic Strait; whilst its ultimate fate when it had doubled the eastern end of Joinville Island is equally within the recollection of all.

It is curious to notice in this connection that during the summer of 1908-9 the whalers had found no difficulty in crossing Antarctic Strait, and had reached Hope Bay without meeting with ice. Moreover, in that year they had found no ice on the inner side of Deception Island. During the summer of 1909-10 we had been debarred from approaching Joinville Land by ice which much resembled the description given by Captain Larsen, and in our case, as in his, the inner bay of Deception Island was filled with a thick pack. And yet at our winter station at no great distance the season had been mild.

The predominant winds in this region are incontestably those from the east-north-east and north-east, always accompanied by snow and thick fog, and generally blowing with the force of a tempest. The whalers recognise but one good anchorage at which to exercise their calling in the interior of the Deception Basin. They anchor in a wide bay situated just within the entrance, but the depths there are considerable, and the holding bad. Pendulum Cove has been destroyed by falls of the cliff, and can hardly be said to exist any longer. In the small bay which remains there is still good shelter from storms from the north-east and east-north-east, if one anchors in shallow water quite close to the shore, but the position is very unpleasant when the wind is from the south-west or north-west, from which quarters it often blows with great force. Sheltered anchorages with good holding ground (soft mud) are to be found in Admiralty Bay, George I. Island, which is divided into two fairly deep fiords, formerly much and still occasionally frequented by the whalers; the best occur in the north-east fiord. Of this bay we executed a particularly careful survey. Unfortunately, it is just in this part that there may be the greatest abundance of ice *débris* derived from the high cliffs terminating the enormous glaciers which cover the island. This may not only make all movement impossible, but may even put vessels in real danger.

The whalers (so they informed me) sometimes find a temporary shelter against squalls from the north-east, with good anchorage, in South Bay, Livingstone Island, but there is no possibility of landing in this bay, which is bordered by an ice-cliff and is open to the south and

south-west. They also stated that they found some temporary shelter from sudden gales on the coast of Palmer Land, especially at Astrolabe and Trinity Islands. As they are often obliged, in chasing the whale, to push a considerable distance into Gerlache Strait, Port Lockroy, discovered by us in 1904, would offer them excellent shelter and a quite safe anchorage, though there may be a good deal of ice in it, and in November 1909 the roadstead was completely blocked by heavy pack-ice.

In Gerlache Strait the voyager meets only ice-blocks, a few rare icebergs, and drift-ice derived from these: but in Bismarck Strait, which is merely the entrance from the Pacific into Gerlache Strait, navigation may be rendered very difficult, if not impossible, by thick pack interspersed with icebergs. Rocks, too, are numerous and treacherously concealed, rendering the exit extremely perilous, even when the weather is calm and clear and the absence of ice permits the bottom to be seen from the masthead. It seems that in 1908-9 we must have had the advantage of a season exceptionally free from ice in these localities.

Middle Island continues to appear on the Admiralty charts, though I am at a loss to know who is supposed to have discovered it. It certainly has no existence. Nordenskjöld had already stated this, and Bellingshausen, whose map of the Shetlands is very good, as are also his views of the coast, had given no indication of it either.

The little bay in Wandel Island, where the *Français* found it possible to winter in 1904, is, in fact, an execrable spot, and we may consider ourselves fortunate in having spent nine months there in 1904 without serious damage. The small size of the vessel evidently contributed much to this result, for, placed as we were at the extremity of the cove, we were able to stretch one of our big chain-cables across a narrow neck, and against this the small ice, and sometimes even blocks of large size, accumulated so as to form a floating rampart which prevented us from feeling any severe effects from the surf. But a vessel of the size of the *Pourquoi Pas?* would be placed in jeopardy. In fact, this cove is open to the north-east, *i.e.* to the winds which are most frequent and most dangerous. From the moment they begin to blow, sometimes even for several hours previously, the surf becomes dangerous, and the *Pourquoi Pas?* was in a position which caused anxiety during her stay of a few days in January 1909. Not only was it impossible to protect her owing to her size, but the state of the ice at that season added to the risk. Small ice and sea-ice were entirely absent, and the formation of a protecting rampart as in the case of the *Français* was thus impossible. On the other hand, large ice-blocks were numerous, and in spite of our attempts to form a barrier by means of wire hawsers, they constantly broke or overrode them and threatened the ship. Nevertheless it may be worth while to mention that in summer, in spite of the truly imposing accumulation of ice in this cove after a north-easterly storm, a ship runs no risk of being held fast, for as soon as the wind ceases to blow from this quarter, even though a calm succeeds, a permanent current to the northward soon carries the blocks away. It is different at the close of the winter season. Although the winter of 1904 was appreciably different from that of 1909, a thick coast pack formed during both years in the

northern bay of Wandel Island, and we were driven to opening a channel by force in order to free the *Français* in December. A reconnaissance showed me that in November 1909 the coast pack was still more extensive and thick, and it would have been extremely difficult to set a vessel free at that time.

For all this, I still think that Wandel Island would be an excellent spot in which to establish a permanent observatory; for it seems to me that a ship could always reach this spot to replenish its supplies during summer by taking the route via Gerlache Strait, and could easily, by making use of the experience gained on our two expeditions, find shelter during the few days required for unloading the stores and other material. It is to be wished that the Argentine Government would put this scheme, which has been under consideration for several years, into execution.

In Petermann-Lund Island, some ten miles further south, we found a decidedly better harbour, and we made a careful survey of it. A vessel would find excellent temporary shelter there, although during winter it presents certain dangers arising from the surf and from ice-blocks. But this harbour is not open every season; and in 1904 it would have been impossible to make use of it, for it was completely blocked by the coast-ice, at least from February to December. Large icebergs too, by completely sealing up Lemaire Channel and Salpetrière Bay, may bar access to it.

Throughout the whole remaining ground covered by our expedition we did not discover a single spot at which one could think of wintering with a ship. One meets everywhere with precipitous walls of ice from which masses are constantly breaking away, and bays offering no possible anchorage by reason of their depth, the nature of their bottom, or their exposure to winds from the north-east or east-north-east, which almost always blow with the force of a gale, and which are so frequent as to justify their being characterised as permanent. To this must be added a constant movement to and fro of large ice-blocks and icebergs, which occur in large numbers, and frequently fill the bays entirely, so that no ship could escape them.

In spite of the considerable difference in the state of the ice at the dates of our two expeditions, navigation between the chain of the Biscoe Islands and the coast proper has always appeared to me impracticable south of Petermann Island, while the many dangerous reefs would also render it extremely hazardous. As far as Adelaide Island this whole coast is formed of imposing glaciers, almost all with impracticable faces, and descending like cascades or torrents from high precipitous mountains. Apart from small islands or reefs, a few rocky points, and the few cases where the glacier faces are low, landing is an impossibility. Moreover, even on relatively practicable glaciers all advance is soon barred by a high wall of granite rising abruptly to a height of over 1600 feet, and topped by a thick layer of ice, possibly, as seemed indicated by a view from the seaward, forming an interior ice-sheet.

To the west of the Biscoe Islands, it appears that navigation ought always to be easy as far as the northern part of Adelaide Island, for though icebergs are always numerous they are widely scattered and

become less frequent the further one moves from the coast. The sea is forbidding and agitated, and seems in fact to be rarely calm.

Biscoe Islands are extremely numerous, following one after another and overlapping so as to form a vast chaplet. The most northern, that named by us Victor Hugo, stands alone and at a distance from Graham Land. This chaplet of islands terminates southward in Adelaide Island, which forms their continuation, as may be also said of Alexander I. Land. All the Biscoe Islands are capped with ice, and, although of different size, present a uniform character. We were unable to find the island named by Biscoe Pitt Island, of which, with its interior bay, he speaks in his logs: but we have marked on the map. with the name Pitt, a large capped island nearly corresponding with Biscoe's in its latitude and longitude. I am not aware of the reasons for which the English Admiralty Chart marks high peaks on this island, for Biscoe speaks of such in none of the documents that I have been able to consult, and none of the islands display them. As I have just said, Adelaide Island and Alexander I. Land may be considered part of the group, of which they will then be by far the largest units, and the only ones whose summits break the monotony of the uniform ice-caps.

Almost exactly in the latitude indicated by the American whaler Pendleton, we succeeded, by passing between some of the more widely spaced of the Biscoe Islands, in making our way into a vast bay encumbered by ice. The details given by Pendleton prove without question that he did cruise in this region, and I do not doubt for a moment that the bay indicated by him is really that rediscovered by us. To the north of the island there is a vast fiord with complex ramifications to which we have applied the name Matha. This fiord must certainly be very deep, but a solid and thick coast-pack prevented us from surveying it completely. It is at this fiord that the narrow channel separating Adelaide Island from the mainland terminates. In its navigable portion the fiord was encumbered by masses of ice of all sizes, including very large bergs, mostly tabular in form, or originally derived from such. In one of the islets there is an important rookery of Adelie penguins, evidently occupied for many years, and apparently indicating the presence of open water of some extent.

Adelaide Island has been well described by Biscoe, whose only mistake had to do with its size. While he gives it a length of 8 miles, it really extends to 70. Biscoe thought himself very much nearer to it than he really was, and it is for this same reason that he gives a height of 10 feet to the ice-cliffs, which in reality reach 100 feet. Its general shape is that of a kidney bean with the concavity turned towards the continent. Its whole eastern coast is formed by a magnificent mountain mass, whilst its western side is composed of an enormous ice-cap, showing a convex surface of almost mathematical regularity. It was Biscoe's mistake in regard to its size which led us to think we had discovered a new land when wrecked in the *Français* on its coast. The *Belgica* followed the coast of Adelaide Island, though it was for the most part concealed from those on board by fog. With more favourable weather they would have been able to excute the survey which we effected ten years later.

The Winter Station at Petermann Island.

On a Glacier in Graham Land.

In 1905 we fell in with ice forming a thick and closely pressed pack about 70 miles north of Alexander I. Land, and ending abreast of a line terminating the northern third of Adelaide Island. In 1909 the conditions were more favourable, and we only found the pack to the south of this island, being thus able to follow the western and southern coasts. The voyages of Evensen, De Gerlache, and our own in the *Français* seem certainly to indicate that, as a rule, the pack forces the navigator who, coming from the north, follows the coast of South American Antarctica, to bear to the south-west roughly in the latitude of Adelaide Island. In 1909 we were possibly favoured by an exceptional state of the ice, and unfortunately no information on the subject is to be had from the voyages of either Bellingshausen or Biscoe. The point is however important, for an expedition which, like our own, might reach the south end of Adelaide Island, and might decide, say, to winter on land at some point on Marguerite Bay, would perhaps run the risk of seeing its communications with the ship cut for several years in succession.

Along the west coast of Adelaide Island, reefs just awash are in considerable numbers even at a distance from the land. Some of these reefs have their positions marked by large icebergs, which generally occur in groups. These have probably been stranded on shoals or held up by pointed rocks. It is important to note the mistake made by some navigators—a mistake of which we were ourselves the victims on board the *Français*—in thinking that, as the icebergs draw a large amount of water, a vessel may feel quite secure in their vicinity.

At the south end of Adelaide Island the great ice-cap terminates abruptly, without transition, in a fine cape formed by the approach to the sea of the chain of high mountains referred to above. I have the honour to bestow on this cape the name of Queen Alexandra. A narrow channel strewn with islets separates Adelaide from the land to which we have given the name Loubet Land, and which is continued southwards by Fallières Land, thus forming a vast bay which we have designated Marguerite Bay. The channel was occupied by a thick coast pack, which both bordered the coast and probably abutted on Alexander I. Land, and was impassable by a ship although only of a moderate degree of compactness. This pack enveloped a number of islets and contained some enormous tabular icebergs, especially towards the south.

We were able to touch at a small island about 2500 feet in height (Jenny Island) not far from Cape Alexandra. This island might possibly form a good land station to winter in, for houses could easily be built on a fine level terrace formed of boulders. If the ice which connects it with the neighbouring islands does not break up, it might be the starting-point for some interesting sledge excursions. It is, however, to be feared that on the one hand this island may only rarely be attainable by a ship, and on the other that it may be isolated from the coast by a loose pack impracticable alike for a vessel and for sledges. This is what seemed likely to happen during our stay. However, if the first eventuality were realised during the course of an expedition, the probability is that persons wintering ashore could make their way to a ship lying in Matha Bay by crossing the pack-ice in the channel.

Both Loubet and Fallières Lands show, morphologically, a complete analogy with the lands farther north; they appear, however, less elevated, and from a distance at least their glaciers seem more practicable. They are intersected by deep fiords, and the *tout ensemble* of this part of Antarctic, beginning from the Shetlands, forcibly recalls the Chilian coast of Patagonia. Marguerite Bay and the whole area separating this part from Alexander I. Land is strewn with islets and with many and dangerous reefs just awash, on which the sea does not even break. Icebergs and *débris* of icebergs are in vast quantities, and the pack-ice which we had to traverse with great toil in order to reach Alexander I. Land was formed of blocks of large size and remarkably thick—a fact which seems to prove that this ice is not broken up every year. A ship overtaken by a storm in this region would find itself in an almost desperate situation.

Like Adelaide Island, Alexander I. Land is composed of an enormous ice-cap, but in its case this cap is surmounted by two ranges of mountains at right angles to each other, forming as it were, when represented diagrammatically, the two arms of a huge T, the shorter running from east to west, and the longer from north to south. The former ends in the sea, and I should not be surprised to find that the east coast of Alexander I. Land is formed by a mountain mass comparable to that of Adelaide Island. There is no doubt that Alexander I. Land is a large island separated from the continent by a wide strait. On the other hand, I cannot assert positively that Fallières Land is prolonged westward so as to join Charcot Land; still, while taking due count of the illusions of which explorers may so often be victims, I believe that I saw some high summits farther south. The discovery of Charcot Land to the south-west of Alexander I. Land certainly seems to confirm the idea of a continuity of land, and the presence of a permanent stretch of pack-ice, with a northern limit, which varies to but a slight extent, seems to support what can hardly be called an hypothesis.

Charcot Land evidently forms one continuous land, which is well characterised by three summits, certainly rocky in structure, which emerge from a wide and elevated terrace of ice. We have assigned it on the map the limits within which its existence was recognised by all on board, but I may be permitted to state that several of the party could distinguish it stretching both east and west into the far distance, and the limits laid down have been adopted so as to avoid all suspicion of exaggeration.

From this land to our farthest westerly point we followed the edge of the pack, often entering it, but making no effort to force a way through it. From 73° to 80° west of Greenwich our course lay to the south of the track, including a portion of the drift, of the *Belgica*. From 82° to 87° we crossed the line of this drift, and then, as far as Peter I. Island (most accurately placed on the map by Bellingshausen) we kept to the north of the *Belgica's* drift, and to the south of the Russian navigator's track. No island, nor even the suspicion of an island, was met with, and Peter I. must be considered as an isolated outpost. On the other hand, our soundings, in conjunction with those of the *Belgica*, confirm the existence of a continental plateau in this

locality. From Peter I. Island our course was sometimes to the north, sometimes to the south of Bellingshausen's, but constantly north of that of the *Belgica* as far as 103°—the position where that vessel escaped from the pack. At this spot we discovered a very large indentation in the pack—the same, evidently, as had been found by the *Belgica* in 1898, by Knox in March 1839, and by Cook in January 1774; while Bellingshausen would very probably have found it in 1821, if he had made more southing, and must in fact have observed its commencement. He says that on reaching the longitude in which Cook attained his highest latitude he voluntarily passed on, continuing his voyage in a due easterly direction. This justifies the supposition that he would have been able to advance southwards, thanks to the absence of ice, for, with the vessels of those days, there could have been no question of an attempt to force a way through the pack. The persistence of this notch in the ice is in my opinion an important piece of evidence in support of the existence of a land to the south, for such permanence can hardly be explained otherwise than by the supposition that fixed points of resistance exist in that direction.

When Knox says that he was brought up in 70° south, 102° west, by a high wall of ice, it is evident that he was the victim of a mirage effect such as we have experienced ourselves in the Antarctic on several occasions, for no such wall has been seen, either by the *Belgica* or by ourselves, though in our south-westerly course we passed the point reached by the American expedition. The track of Cook, which took that meritorious navigator on January 30, 1774, to the latitude of 71° in longitude 107° west, ran roughly from north to south and then from south to north, so that, except on the 107th meridian, the track of the *Pourquoi Pas?* from 103° to 124° lay far to the south (three and even five degrees) of those of previous navigators. We crossed Cook's route 30 miles to the north of his turning point, thus meeting with the pack half a degree farther north than he did. We should have found no difficulty in reaching or even probably in passing his extreme latitude, had we forced a way through the pack, which was not particularly solid at this point. But as this would have been an advance of a few miles only, and without special interest, I felt that it would be better to economise our scanty stock of coal for a more useful effort in a region hitherto unknown. When, after having followed the seventieth parallel, with slight deviations to the north or south, we were forced by the failure of our coal supply, coupled with a fresh outbreak of scurvy, to bring our labours to a close at 124° west, the ice seemed to trend towards the north-west, and then even sent a tongue of thick pack-ice to the east—an obstacle through which we had to force our way. Nevertheless there is no reason to conclude that, if it had been feasible to continue our voyage, we should not have been able to turn this extension of the ice and regain our former latitude in this direction. This is a piece of exploration which seems to me of great importance, and one which is well worth resuming.

Our course from Peter I. Island to our extreme westerly longitude was rendered excessively perilous by the truly incredible number of ice-bergs in the midst of which we had to wind our way. Several thousand

were constantly in sight, and I think I am justified in saying that even a vessel possessed of specially good tacking qualities would have been unable to steer clear of them under sail only. The presence of these icebergs covering such a vast extent of sea seems to prove the proximity of a land-mass, and it is noteworthy that in form, aspect, and size, most of these were identical with those bergs met with in the vicinity of South American Antarctic. It is not, however, to be supposed that all can be derived from the latter land-area, since the extreme abundance above-mentioned only began after we had left Peter I. Land.

The fact that we were able to take a course so far to the south of our predecessors inclines me to the opinion that we had the advantage of exceptionally favourable conditions, and it may be that the pack of normal years breaks up after a mild winter or series of winters, or that, in consequence of an unusual succession of favourable winds, it had released from its grasp icebergs that had long been held fast. Our soundings revealed the existence of a continental plateau forming a prolongation of that brought to light by the *Belgica* farther east; while the permanent notch of which I have spoken, as well as the icebergs, is an additional argument for the presence of a continental coastline. Lastly, the aspect of the pack is identical throughout this whole region from Charcot Land to 124° west. Commandant De Gerlache, with whom I have had long and interesting conversations on this subject, shares my opinion, and, besides, called my attention to the fact that the mere examination of the drift of his ship when fast in the ice was in favour of this hypothesis.

During the whole of our expedition the predominant winds, and the only ones which blew with violence, were those varying from east-north-east to north-east. At the position of Peter I. Island the storm which overtook us began from the east-south-east, but it quickly veered round to the east-north-east. The predominance, not to say permanence, of these winds clearly helps a navigator sailing from east to west, as has been justly remarked by Dr. H. R. Mill. Unfortunately they are always accompanied by snow and thick weather, which obscures all view, and, apart from the dangers to which the vessel is exposed, causes the voyager to lose the advantages arising from the rapidity of his progress. The storms of this region, which last from twenty-four hours to four days, are generally succeeded in summer by one or two days (sometimes only a few hours) of clear weather. The ideal condition would be to have a vessel possessing a motive power and supply of fuel which would permit her to stand by without drifting while the storms lasted, and to make good headway when favoured by a few hours of fine clear weather.

I feel that I ought, before closing this rapid summary of ideas suggested by our voyage, to remark once more that, at the present moment, definitive conclusions are out of the question. Any such conclusion can only have real value when it rests on observations studied in their most minute details, and compared with those of other expeditions—a task which can only be carried out when all our results shall have been definitely revised and worked out. Thanks to the zeal of my colleagues since their return, coupled with their thorough work during the course of the expedition itself, this task ought to be finished within a few months at most.

As regards further explorations which could and ought to be undertaken in this quadrant, it seems to me that it would be both possible and highly interesting to explore Fallières Land, and even the regions to the south and east of this, by means of sledge parties. A station might be established on Jenny Island, perhaps even on some point of Fallières Land. The difficulties would be great, no doubt, but I have already dwelt on them at sufficient length to make it unnecessary to recur to them here. I should like, however, to add that, though I think it possible for explorers to return to Matha Bay, if pressed by necessity, it appears to me, judging from my two years' experience, improbable if not impossible that the ice-conditions, even in winter, should be such as to permit the approach to Petermann or Wandel Islands otherwise than in a ship.

The further prosecution of our western voyage beyond 124° west ought to be undertaken. There would be considerable interest, and possibly advantage, in attempting one or two side excursions in a due southerly direction between Petermann Island and our farthest west. This was not done by us because I considered it of more interest to push on westward, especially as the serious injury to the fore part of our ship compelled us to exercise a certain caution. If, as I hope, the *Pourquoi Pas?* with all its equipment is to be definitely set apart by the French Government for scientific explorations, comparatively small sums of money will be needed to continue our work in this region.

The appreciation accorded by the Academy of Sciences and other learned bodies to the labours of this last expedition justifies me in saying that it has done a useful piece of work, and in this I do not lay myself open to the charge of vanity, seeing that those labours were performed by my coadjutors. May the results prove once more the importance and value of Antarctic expeditions!

GEOGRAPHICAL DESCRIPTION OF THE COUNTY OF SUTHERLAND.

By Alice B. Lennie, M.A., B.Sc.

(With Illustration and Sketch-Map.)

(Continued from page 34.)

Roads.

There were no made roads in Sutherland to the beginning of last century, and in many parts of the interior guides were necessary as no vestige of a track was visible. Drove roads, of course, existed from earliest times, as cattle rearing was the main industry of this, as of all the Highland counties. In addition bridle tracks led along the east coast and up the main straths; but it was considered sufficient for the construction of such a road to remove the boulders and fling some gravel or stones on the more boggy parts. Wheeled traffic under such circumstances was, it is needless to say, impossible. Bridges, also, were

lacking; fords or ferries crossed the larger rivers, and were a constant source of danger and even of loss of life, and always caused delay in stormy weather. Over some of the smaller streams wooden foot-bridges were erected, but were not always kept in repair. The only large bridge, prior to the nineteenth century, was that over the River Brora, a tidal river where it is spanned, but flowing in a very narrow rocky gorge. This bridge dates from very early times, as Sir Robert Gordon records that it was repaired in 1619. In 1794 it was again in disrepair and actually dangerous.

In 1811 advantage was taken of the Highland Road Act of 1803, and roads were constructed by the Parliamentary Commissioners along

The Mound.

the east coast from Bonar Bridge to the Ord of Caithness, and also through the centre of the county from Lairg to Tongue, a total length of 96½ miles. Roads extending over 384 miles were afterwards made by statute labour assessments, and over 30 miles from Lairg towards Scourie by the Duke of Sutherland in connection with the Highland Destitution Fund of 1847 (half the cost was defrayed by the Duke himself). Tolls were never established on these roads, the population being too scattered. They were tried at Bonar Bridge and Helmsdale, but the receipts were small, and came chiefly from those in the immediate neighbourhood.

On all these roads substantial bridges were built over the rivers and burns. The bridge over the Kyle of Sutherland at Bonar was constructed by Telford at a cost of £13,971. It consisted of two stone arches of 50 and 60 feet span, with a central iron arch of 150 feet, which was

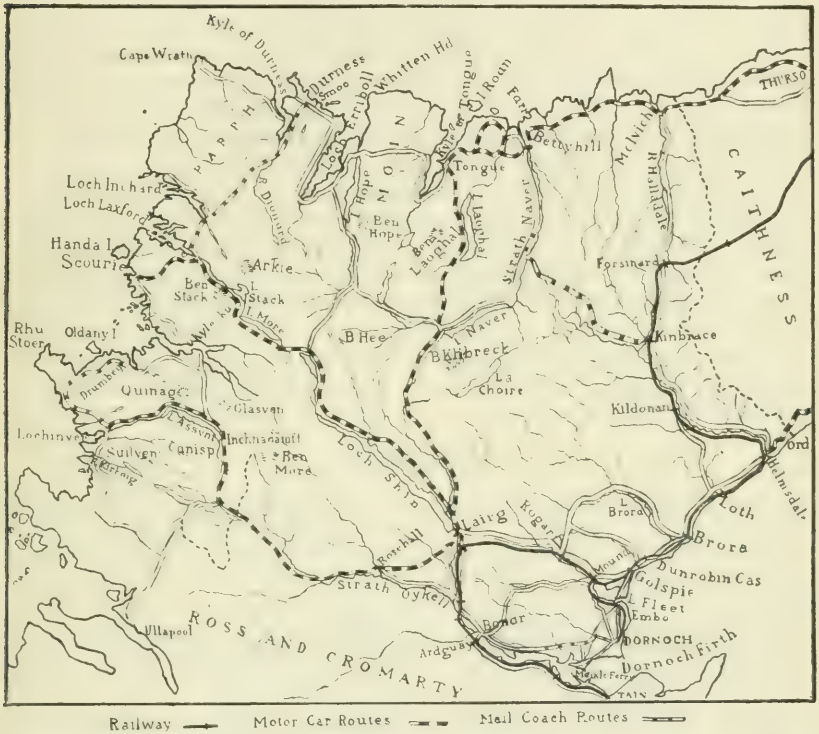
brought all the way from Wales. The second great inlet, Loch Fleet, is crossed by a large dam, known as the Mound. It is 3000 feet long and 18 feet high, and terminates at its north end in a bridge with sluices, which allows the outflow of the Fleet at low tide, but prevents the access of the sea to the upper part of the loch, by which means several hundred acres have been reclaimed from the sea. The bridge at Helmsdale, also, was a great boon, the river being impassable in flood. In the north, chain ferries were established across the rivers Halladale, Naver and Hope, since replaced by iron bridges. The ferries across Loch Eriboll and the Kyles of Tongue and Durness continue to be used occasionally. The latter is still the only means of access to the road to Cape Wrath lighthouse: but in the two former cases roads have now been carried round the heads of the lochs. In the west, between Assynt and the north, the only road is over Kylesku Ferry, where there is a chain boat for motor cars and other vehicles, but though it is the only way down the west coast, few conveyances cross.

The present roads are shown in the accompanying map. In the east they are comparatively broad and well kept, separated from the fields by well-built walls, fences or even hedges. But in other parts they are very narrow, some eight or nine feet, and generally bordered only by a ditch. The surface too is rough, as the road metal is thrown down as the ruts wear, and left to be ground down by passing traffic. Although the county possesses at least one steam roller it seems to be little used on these roads, possibly because there is so little room for conveyances to pass. Along the road by Loch Assynt to the River Oykell, proper crossing places have been made, but in most other parts conveyances must slow down to squeeze past one another, or sometimes one of them may take advantage of any level ground to draw up out of the way. Such level spots, however, are not easily found; often the only available extra space is the grassy verges, and beyond these, on the one hand the ground may slope more or less steeply down hill, and on the other there will almost certainly be a ditch. Such conditions can only be tolerated because there is scanty traffic on the roads. The gradients also are very high; in many parts of the north and west 1 in 10-15 is frequent, and even 1 in 8 occurs along the north coast, where there is a constant succession of very steep hills, the road being carried across a high plateau frequently intersected by deeply entrenched rivers. The gradients in the interior are much less, since the roads follow the main valleys, as already described.

Stone bridges cross all the streams on the main roads, but in times of exceptional flood they are liable to be swept away. Last year no fewer than four were destroyed in the north at the beginning of August, an occurrence unparalleled for the last fifty years. At the same time, between Bettyhill and Skerray, at a place where the road is led across a steep declivity, a landslip buried a section of the road under six feet of débris, and carried away a length of the outer wall with its adjacent strip of roadway. In 1893 Telford's Bridge over the Kyle of Sutherland collapsed owing to the sapping of its foundations. A new iron bridge has taken its place, having spans of 70, 105, and 140 feet respectively, considerably longer, therefore, than the former one.

Means of Communication.

In 1819, not long after the construction of the roads, regular communication was established between Inverness and Thurso, a mail-coach leaving each place daily. This system was gradually extended in Sutherland till the chief places on the west and north were connected twice or thrice a week with Golspie or Thurso, and could thus receive news from London within five days, but at a cost of 5s. 8d. for one oz.



Sketch Map showing Roads and Means of Communication. Scale, 14 miles to 1 inch.

The Highland Railway had reached Ardgay, opposite Bonar Bridge, by 1864. The following year preliminary steps were taken for the Sutherland Railway, which was to extend to Brora, 32½ miles, and in 1868 this line was opened as far as Golspie, its continuation being abandoned. The Duke of Sutherland, however, in 1870 obtained powers to construct a line from Golspie to Helmsdale, which was reached the next year. Finally the Sutherland and Caithness Railway, opened in 1874, completed the main line in Sutherland within ten years of its introduction, practically linking up John o' Groats with Land's End, a distance of over 1000 miles. The only addition has been the seven miles of light railway from the Mound to Dornoch, opened in 1902.

The railway is confined to the eastern side of the county, but it

makes two long detours which, while they detract from its value as a direct route between Inverness and the ports of Wick and Thurso, shorten the distance between it and the north and west coasts of Sutherland. In the central section, from the Mound to Helmsdale, little levelling of the ground was required. The southern half of the coast strip consists of a series of flat terraces formed by raised beaches, with steep escarpments between. Viewed from the east, in places where the railway runs along the edge of such a terrace, it is hard to believe that it is not an ordinary railway embankment. Further north, the line approaches quite close to the sea, almost within reach of the waves. There are three trains in the day each way as far as Helmsdale, only two beyond, and once a week a special through express. The time taken within the county is from two to three hours, but, as it is a single line, delays are frequent. The journey from Edinburgh, even by express, takes eight hours.

In connection with the railway, daily motor cars are run from Lairg to Lochinver, to Scourie, and to Tongue: and along the north coast from Thurso to Tongue. Further extensions are made by mail coach from Lochinver to Drumbeg and from Laxford, on the Scourie Road, to Durness. A mail cart also plies between Strath Naver and Kinbrace.

Steamers and sailing vessels call more or less regularly at all the piers, and in the north and west carry all the heavy goods traffic. Lochinver and Scourie are the only places with a regular service of passenger boats.

Meteorology.

Table I.—Mean Temperature and Rainfall for Stations in Sutherland.

	Dunrobin.		Lairg.		Tongue.		Cape Wrath.		Scourie.		Stoerhead.	
Altitude of Station	16 ft.	14 ft.	458 ft.	451 ft.	40 ft.		400 ft.	355 ft.	45 ft.		195 ft.	145 ft.
	Temp. in ° F.	Rainfall in in.	Temp. in ° F.	Rainfall in in.	Temp. in ° F.	Rainfall in in.	Temp. in ° F.	Rainfall in in.	Temp. in ° F.	Rainfall in in.	Temp. in ° F.	Rainfall in in.
Jan.	38·2	2·57	35·5	3·36*	38·0	3·80*	39·1	3·97	38·8	4·09	39·8	4·69*
Feb.	38·9	2·46	35·9	2·96	38·6	3·36	38·8	3·01	38·9	3·37	39·3	3·48
Mar.	40·1	2·23	37.8	2·91	39·7	2·92	39·0	2·43	39·5	3·21	39·5	3·10
Apr.	44·3	1·77	43·0	2·21	44·1	2·03	43·0	1·97	44·3	2·13	43·2	3·74
May	48·6	1·70	48·0	2·18	48·6	1·70	47·3	2·16	48·6	2·03	47·5	2·72
June	53·7	2·05	52·8	2·33	54·3	2·02	51·7	2·41	53·2	2·37	52·3	2·84
July	56·2	2·44	55·5	2·91	56·0	2·55	54·1	3·24	55·1	3·31	54·4	3·75
Aug.	56·1	2·60	55·4	2·82	55·9	2·80	54·4	3·77	55·4	3·51	54·6	4·16
Sept.	52·6	2·66	51·5	3·00	52·6	3·54	51·7	3·88	53·0	3·56	52·2	3·57
Oct.	47·1	3·31	45·5	3·95	46·7	4·42	46·5	4·53	46·5	5·18	47·3	5·48
Nov.	41·5	3·43	39·6	3·93	41·2	4·17	42·0	4·31	42·2	4·71	42·9	4·67
Dec.	38·8	3·39	37·1	3·95	39·3	4·40	40·4	4·18	40·4	5·04	41·0	4·76
Year	46·3	30·81	44·9	36·51	46·2	37·71	45·7	39·86	46·3	42·51	46·2	45·96

The figures are taken from the records of the Scottish Meteorological Society, and represent mean monthly values. The temperature figures are for the years 1856-95, and the rainfall for the years 1866-90. Records marked thus * do not extend over the whole period.

There is a very marked difference in the rainfall of the east and west coasts; the latter is nearly half as much again as the former. The driest months are in spring, the wettest in autumn. Though the rainfall is dependent on general cyclonic conditions, its distribution is largely influenced by the configuration of the county. The prevalent winds, as for Britain generally, are from the south-west, and bring abundant rain to the west coast and a still larger amount to the mountain barrier inland, but they are much drier for the east coast where the chief rain-bearing winds are easterly. With such winds it is quite a common thing on cloudy and showery days in the east to motor over into brilliant sunshine on the west coast. Even in the case of a heavy downpour in the east, the rain, though it may wrap the western mountains in dense cloud, seldom extends beyond them.

At Achmore, just north of Loch Assynt, on the lower slopes of Glasven, the annual rainfall is about 75 inches. Indeed, it is excessive for the whole belt of mountains. Their summits are rarely entirely free from mists, and may be enveloped in cloud for long periods. On the other hand, though there is an annual rainfall of from thirty to thirty-five inches on the east coast, yet the soil is so thin on some of the slopes that a dry fortnight is sufficient to scorch the pastures; the crops also are apt to suffer from drought.

Snow nowhere lies long near the coast, not even in the north, but occasionally a severe storm is experienced, and, if prolonged, causes great loss to the sheep-farmers, and there is always a risk of the railway being blocked near the Caithness boundary.

The highest temperatures in summer occur in the inland straths, which have also the greatest diurnal range. In the spring and autumn, though sheltered and genial during the day, they are subject to severe frosts at night, which limits their agricultural value. Yet for residences such districts as Rosehall are very delightful for long periods of the year, as both the strong south-west winds and the chill easterlies are greatly ameliorated before reaching it. On the north and east coasts the most trying feature is the prevalence of cold east and north winds in spring, which retard vegetation and occasionally do much damage. It is due entirely to these winds that the northern plateau and north-west region generally is treeless.

Agriculture.

Table II.—Percentage distribution of Total Land Area (excluding Lochs and Rivers). Average for 10 years' period, 1900-1909.

	Mountain and Heath Pasture.	Arable Land.	Woods.	Permanent Pasture.	All other land and waste.
Sutherland, .	67·3	1·9	1·6	·7	28·7
Scotland, . .	48·2	18·1	4·6	7·6	21·6

The essentially mountainous character of Sutherland is perhaps never more clearly seen than in considering its agriculture. It is before everything else a grazing country: sheep farms occupy about half the interior, and large tracts of the remainder are given over to deer.

Permanent pasture amounts to only 0·7 per cent. of the total area: mountain and heath pasture to nearly 70 per cent. The greater part consists of heather, peat moss, and bog, an apparently most unpromising waste, yet in reality it yields valuable pasturage. It is the abundance and constant succession of these alpine grasses and mosses that constitute one of the most important advantages of the county for sheep rearing: but besides these, along the banks of the streams and by the road sides, are bright green strips of grass which are favourite feeding-grounds of the sheep, as the closeness of the turf testifies: indeed, one might almost distinguish the sheep walks from the deer forests by the presence or absence of sheep on the moorland roads. Unlike the sheep of most districts, they strike one as remarkably tame. This may be due to the extreme scarcity of traffic, but they do not seem to mind even the motor cars, as they not infrequently select the centre of the road as a quiet resting-place and are in no undue hurry to rise, thus adding one more to the already formidable list of drawbacks to motoring in Sutherland.

Only 1·6 per cent. of the surface is at present covered by woods and plantations. This scarcity of trees is a great contrast to the early condition of the county, when it was heavily forested, and even the valleys of the north-west were well wooded. The peat bogs everywhere contain large fir-trees which the people formerly dug out and used for the rafters of their feal houses, the splinters serving them for torches. Forests continued to flourish in many parts of the county down to the middle of the eighteenth century. Blaeu's *Atlas* of 1662 represents Sutherland as having plenty of timber, and Kirk in 1677 mentions making a special excursion from Dornoch to see a noted fir wood. It was probably the presence of these forests which attracted the iron smelters, who have left abundant traces of their presence in the slag heaps scattered over Sutherland. In the atlas already mentioned three localities are marked in Strath Naver, two where iron was obtained and the third where it was smelted. Sir Robert Gordon, writing about the same time, says, "In divers pairts of this cuntrie ther is abundance of iron ore, wherewith the inhabitants make good iron." Specimens of their workmanship are preserved in the cannon still to be seen at Dunrobin Castle. The presence of the furnaces may, as elsewhere, have contributed to the destruction of the forests. Towards the end of the eighteenth century the scarcity of wood began to be seriously felt. In the *Old Statistical Account of Scotland*, 1793-5, almost the only woods mentioned in Sutherland were in the parish of Creich, which seems always to have been famous for its woods of oak and fir, as its very name would indicate. It is added that large quantities had been recently cut down by the people for the tanning of their leather.

Plantations of fir, larch, and hardwood trees have been planted from time to time since the beginning of last century, chiefly in the south-east

corner. Few trees are of earlier date than that, probably only those round Dunrobin and at Tongue, and some at Skibo, Achany, and Rosehall. Much larger areas still might with advantage be devoted to plantations. It is only from the south-east that there is any export of timber. Elsewhere it is mostly grown for the sake of shelter. But at the Little Ferry piles of pit props and other wood may be seen, stacked up awaiting shipment, and a similar trade is carried on by the Dornoch Firth. As early as 1834 the export from Creich was considerable. In this connection the following figures are of interest. Timber (chiefly pit props) to the value of £4068 was sold from the estate of Skibo in the eight years 1847-55, giving a net profit of £2375.

The natural wood consists of silver birch, with eared willow, alder, mountain ash, and similar trees. The willow and birch are especially characteristic, as they are the only trees that manage to exist in bleak, exposed situations. The former assumes many forms, from a typically arctic growth a few inches in height along the wind-swept northern cliffs, through shrubs of a foot or two, which may easily be mistaken for bog myrtle, and larger bushes of 3 or 4 feet up to the full grown tree, which greatly resembles the silver birch. The best wooded area in the north is at Tongue, where large plantations of beech, oak, sycamore, and other hardwood trees add greatly to the beauty of the district. They are healthy and well grown, but sometimes suffer severely in the spring from the bitter north winds. Bishop Pococke on his visit to Tongue in 1760 referred to the fruit and other trees. Strath Naver also has a considerable amount of birch wood and plantations to shelter the sheep farms. In the west many of the lochs are fringed with birch and willow, which, with their water-lilies and reeds makes them a pleasant interruption to the barren rocky country by which they are surrounded. Also a considerable area near the sea between Scourie and Kylesku is preserved as shelter for the deer, and many charming bits of scenery in Assynt owe their beauty to the trees and woods.

The average amount of arable land, 23,000 acres, is less than two per cent. of the total area. Large arable farms are confined mainly to the narrow fringe of low ground in the south-east. Smaller farms and crofts occupy many of the straths and irregular areas on the north and west coasts. In the interior only isolated patches are cultivated; either in connection with the sheep farms, or by gamekeepers and shepherds. The increase in the total amount of arable land during last century has not been very great, if we may trust the estimate of 18,000 acres made by Captain Henderson in 1808. Much more reliable figures are those published by the Highland and Agricultural Society in 1854, which showed a total of 18,757 acres. Small though the difference is, it involved a considerable change in the distribution of the land, owing to the removal of so many crofters from the interior to the coasts. The larger farmers who had settled on the richer ground of the east also greatly improved and extended their lands. The small total is not due to lack of efforts to increase it. Sutherland has been the scene of some of the most strenuous attempts at land reclamation, aided by all the powerful resources of modern steam power. Yet success was but meagre,

and proved the dominant control of climatic conditions. Large steam ploughs were employed to cultivate the land to a depth of about two feet, and other steam implements completed the work and left the ground ready for the seed. Between 1873 and 1876 nearly two thousand acres were brought under the plough at Lairg, chiefly on the shores of Loch Shin and in the valley of the River Tirry. In the following year similar work was begun at Kildonan. The apparent success of some of the first experiments led to further reclamations on a gigantic scale. The site selected was the bleak moors west of Kinbrace, but it was found that on these uplands the harvest was precarious and the fertility of the land could not be maintained without expensive manures, and so it was allowed to lapse again into moorland. In time the land at Lairg also proved disappointing: for though it bore heavy crops in favourable seasons, they were very apt to be spoilt by early frosts. In this case, however, it formed excellent pasture when sown with grass, and by attention to the drainage, and an occasional dressing of basic slag, is capable of carrying thrice as many sheep and cattle as before, and maintains them, moreover, in better condition, the sheep and lambs from Shinness having fetched the highest price at Inverness wool market for the last quarter of a century.

Before the nineteenth century cultivation was of a most primitive type, continuous crops of oats, bere, and potatoes being taken with no fallowing: and the houses of all but the better classes sheltered family and live stock alike, separated merely by a rude partition. They were built of turf divots, the only valuable part being the roof beams of birch or bog fir. These were removed every three years or so, to be used in building a new house, the remains of the old one forming most valuable manure for the fields. The periodic destruction of these small and very insanitary dwellings must have helped in no small degree to prevent the spread of infectious diseases. But in proportion as the fields were enriched, the pasture was destroyed, a common cause of complaint when sheep farming was introduced. After the manufacture of kelp ceased, the sea ware was used for manure by those within reach of it. Lime was very scarce and difficult to get. When the country was opened up several farmers from the south leased lands in the arable districts, and introduced improved methods and implements. The large sheep farmers also cultivated considerable areas, chiefly for winter food for their stock. Nowadays the best modern machines and manures, and methods of cropping suited to the climate and soil, are common on all the large farms. Among the crofters, too, the caschrom, lazybeds, and turf houses are things of the past. Their main crops are oats and potatoes with the addition of turnips, and these are still grown in narrow strips, but the fields are now generally enclosed. They are not as free of weeds as they might be: in the north in August may be seen fields bright with the yellow marguerite, growing indifferently among the corn or green crops, and forming a vivid line of colour in the waste strip between.

TABLE III.—AVERAGE AREAS OF THE CHIEF CROPS AS PERCENTAGES OF THE TOTAL ARABLE LAND. Average for ten years' period, 1900-1909.

	Grass and Clover in Rotation.	Oats.	Turnips.	Potatoes.	Barley.	All other Crops.
Sutherland,	39·6	34·6	13·1	6·9	4·6	1·2
Scotland,	45·7	27·8	13·1	4·0	6·3	3·1

TABLE IV.—AVERAGE YIELD PER ACRE, 1900-1909.

	Sutherland.	Scotland.
Oats,	30·93 bush.	37·14 bush.
Barley,	28·29 ,,	35·65 ,,
Potatoes,	4·56 tons.	6·20 tons.
Turnips,	10·29 ,,	16·06 ,,
Hay (Clover),	10·24 cwts.	32·42 cwt.

TABLE V.

AVERAGE ACREAGE UNDER VARIOUS CROPS, ETC.

Compiled from the Annual Returns to the Board of Agriculture.

	1870-74	1875-79	1880-84	1885-89	1890-94	1895-99	1900-04	1905-09
Arable land,	19,748	22,493	25,243	24,914	22,704	23,016	23,164	23,129
Permanent pasture,	4,248	5,962	7,673	8,680	8,719	9,245	9,578	8,476
Mountain and heath,	...	...	...	...	...	944,698	834,789	862,186
Woods,	7,296	...	12,260	15,799	18,784	29,041	...	20,382
Orchards,	...	2	...	2	2	3	1	1
Wheat,	309	93	45	6	2	0	1	7
Barley and bere,	2,197	2,257	2,273	1,929	1,793	1,443	1,208	906
Oats,	6,310	7,680	8,029	8,054	7,786	7,962	8,021	7,998
Rye,	137	100	110	78	100	98	79	59
Beans and peas,	35	50	33	22	20	20	15	5
Total corn crop,	8,988	10,180	10,490	10,089	9,701	9,523	9,324	8,975
Potatoes,	1,833	1,960	2,085	1,941	1,745	1,656	1,651	1,530
Turnips and Swede,	2,656	3,092	3,251	2,985	3,041	3,109	3,041	3,023
Cabbage, etc.,	3	54	69	34	20	17	28	45
Patches, etc.,	20	52	50	41	29	31	35	27
Small fruits,	...	...	...	2	5	3	1	3
Clover, etc.,	6,063	6,953	7,572	8,125	8,027	8,585	8,986	9,388
Bare fallow,	184	203	1,726[1]	1,698[1]	136	91	99	138

[1] Due to Duke of Sutherland's reclamations.

Wheat is not suited to the county. A fair quantity was grown on the better soil, and even by the crofters, in the earlier part of last century. One of the farmers, himself a large grover, writing in 1831, says, "Wheat is not naturally fit for the country or the climate. It is doubtful whether oats may not, by and by, be found, after lea, the best crop of the two. In the meantime, no farmer can refuse the premium offered by the corn laws of 60s. for wheat in preference to 24s. for oats." A couple of acres are still grown occasionally for the sake of determining the fiars prices, and it is noteworthy that Sutherland wheat is rated at the maximum value.

Oats are the main corn crop, but the amount grown is not sufficient for the requirements of the county. The average yield per acre for the whole county is approximately equal to that of Orkney, Caithness and Inverness.

Potatoes were introduced in the latter half of the eighteenth century, and rapidly became the principal crop of the crofters and cottars, but it is liable to blight by early frosts, especially in the interior straths. In former times, when it was the source of two-thirds of the year's food supply, and grown in unsuitable positions, failure and famine were usual every third or fourth year. The average yield per acre for the county is about three-fifths that of Midlothian, and only slightly greater than in Shetland and Inverness (the lowest in Scotland).

Turnips were on trial at the beginning of last century, and became general along with the spread of sheep farming, but the average yield per acre is the poorest of any county in Scotland. Large quantities are grown only because the demand for them is so great, since the pastures, though excellent in summer, cannot carry the flocks through the winter even with the aid of the arable districts. It was estimated in 1870 that the deficiencies in oats and turnips caused an annual expenditure of £25,000 on the import of these from other counties. It was in view of this fact that the late Duke of Sutherland undertook his great reclamations.

Small fruits are not much grown, yet they do extremely well in the east and even in sheltered parts of the north. A speciality of the gardens of Tongue House are the excellent rasps. In the cottage gardens it is rare to see more than a few gooseberry bushes, or perhaps, some straggling black currants. Their staple "fruit" seems to be rhubarb.

TABLE VI.—NUMBER OF HORSES, CATTLE, SHEEP, PIGS.

	1870-74	1875-79	1880-84	1885-89	1890-94	1895-99	1900-04	1905-09
Horses, . .	2,467	2,547	2,724	2,671	2,597	2,712	2,575	2,603
Cattle, . .	11,479	12,668	12,575	12,207	12,495	12,470	12,425	11,699
Sheep, . .	226,977	226,421	220,560	206,443	211,533	206,256	202,196	203,340
Pigs, . .	1,378	1,186	1,190	1,068	1,047	932	787	692

The number of cattle has remained fairly stationary since statistics were first published, and is not very different from the estimates made at the beginning of the century. Cattle rearing is now only a minor Sutherland industry, except among the crofters, many of whom still largely depend on the sale of their stock for payment of their rent and purchase of necessaries, other than their croft supplies, such as tea, tobacco and whisky. The young animals are sold to neighbouring farmers, who prepare them for market. The small, black cattle of the old Sutherland breed have been replaced by better stock. The picturesque west Highland cattle, with their shaggy coats and wide-spreading horns, are common in many parts, but equally so are polled cattle and shorthorns.

Sheep-rearing is the most important industry, and the one in which Sutherland excels. The sheep are bred and reared in the county, but are sent south to be fattened for the market. They are almost entirely of the Cheviot breed, with a very few black-faced sheep. The first introduction of this breed was in 1807, when two Northumberland farmers rented about a hundred thousand acres in central Sutherland. About the same time the old Kerry (Coary) breed were almost exterminated by disease. They were replaced by black-faced sheep, but the success of the English farmers led to these being, in turn, replaced by Cheviots. The two were equally hardy and very similar in most respects. The decisive factor was the price of the wool. The fleeces were of equal weight, but while Cheviot wool sold for 28s. a stone[1] at that time, the other fetched only from 7s. to 10s. By 1820 it was calculated that there were 118,400 Cheviot sheep in the county, from which they had practically driven out all others.

Compared with border Cheviots, Sutherland sheep are larger, and the wool is finer, and sells for about 2d. per lb. more, the fleece averaging 4 lbs. washed wool. This superiority of Sutherland sheep is owing partly to the climate and excellent feeding, particularly in early spring, partly, also, to the careful selection of stock. The death-rate is very low compared with other counties, and the number of lambs high. As before mentioned, the lambs have to be wintered farther south, at an average cost of 9s. or 10s. per head. They are now generally transported by railway, and may be sent as far south as Aberdeenshire. About 46,000 sheep and 55,000 lambs are sold annually at prices averaging 16s. for lambs, 25s. for ewes, and 30s. for wedders. The rent of sheep-farms varies, of course, very considerably, from about 2s. 6d. to 5s. per head of average winter stock.

The wages of shepherds are higher than in neighbouring counties, probably because the industry was first introduced by southerners who brought shepherds from the south, where wages were higher.

Fauna.

In keeping with the ruggedness and seclusion of the county, are the records of its fauna. It has always been the haunt of the red deer,

[1] At that period the Sutherland wool stone contained 24 lbs. avoirdupois.

whose horns and bones have been found in all the ancient deposits. The Norse Sagas mention the hunting of the reindeer as well as the red deer, but this was doubted till the discovery of its remains proved the truth of those records. The remains of the beaver also have been found, and an interesting deposit in a cave in Assynt contained the bones of Arctic animals, the lemming, vole, and lynx. At one time wolves were common in Sutherland. So common, indeed, that a map of Great Britain of the time of Edward First shows Sutherland with the picture of a wolf, and the note, "*Hic abundant lupi.*" The custom of using the islands of Handa, Oldany, Neave, and others, as burial places, is traditionally ascribed to the prevalence of wolves on the mainland. Certainly, Sutherland was the final retreat of these fierce animals, but the last decade of the seventeenth century saw their extermination. Several were killed at that time in different parts of the county, the very last being a she-wolf and her whelps in the glen of Loth.

Towards the close of the eighteenth century, foxes and eagles were so numerous that the sheep had to be housed regularly every night. Only the goats, which were well able to defend themselves, were allowed to roam the mountain pastures; but even they were often herded with the cattle at the mountain shealings. In the Old Statistical Account of the parish of Golspie it is mentioned that £100 per annum was spent by the county in bounties for foxes. With the advent of the sheep farmer and the development of game preserves, a most determined effort was made to extirpate vermin. An interesting extract of the expenditure of the Sutherland Association for the Protection of Property is given by Harvie-Brown. In the seven years 1819-26 over £1115 was paid in premiums, and 546 foxes, 355 eagles, 1143 wild cats, martens, etc., 7493 hawks, ravens, crows, etc., were destroyed; also 263 otters in the period 1831-34. Foxes have now been reduced to reasonable numbers, but eagles, once nearly exterminated, are again increasing, as they are preserved by the proprietor. Wild cats and martens are becoming rare. The badger is still to be found on Ben Bhragie, and a few otters haunt the streams. A very full list of the birds, animals, and fish, to be found in Sutherland, is given in *A Fauna of Sutherland and Caithness*, by J. A. Harvie-Brown and T. E. Buckley, 1887, and specimens of most of them may be seen in the Museum at Dunrobin Castle, which contains a unique collection bearing on the geology, fauna, antiquities, etc., of Sutherland. Additions of course are always being made. This summer the Cirl Bunting was got at Golspie, for the first time in Scotland (?).

Sport.

Like other parts of the Highlands, the whole county of Sutherland is divided off into shootings. The grouse moors are good, but not exceptionally so. Blackcock, ptarmigan, snipe, ducks, and other Highland game, including mountain hares and rabbits, are plentiful. A very large part of the county is forested. Of the ten deer forests, the Duke of Sutherland owns eight, and is thus the largest forest proprietor in Scotland. When sheep were introduced on a large scale, part of the

Reay forest was let for sheep farms; but it was found that the deer would not remain with the sheep. Hence the leases were not renewed, and the ground was again cleared. In this respect deer forests are unlike shootings, where the sporting rent is additional to the agricultural rent. Roe deer are found in the wooded areas and are increasing with the extension of plantations. Fallow deer were tried at Rosehall, in Strath Oykell, a well-wooded district, but degenerated rapidly.

The rise in valuation of the county during last century is largely due to the shooting rental. The increasing importance of sport has led to the building of shooting lodges all over the county, and gives employment to many of the inhabitants. In the report of the Crofters Commission on the question of deer forests *versus* sheep farms, the conclusion was that both give about the same amount of permanent employment to gamekeepers or shepherds as the case might be; while the extra work as gillies or domestic servants during the sporting season was in favour of the former. Large sums of money are spent annually in the county on buildings and permanent improvements as well as for wages, which thus brings about an increase of traffic and general encouragement of trade; though much of the goods for the sporting tenants come direct from the south. It is also leading to the betterment of the roads. To a certain extent it discourages the ordinary tourist, whose holiday season occurs just when the available accommodation is needed for sportsmen and their servants, and free access to the moors is somewhat restricted. This does not apply, however, to the villages on the east coast, which are the main summer resorts.

Sutherland takes pre-eminence over all other counties in Scotland for angling. Every one of its countless lochs contains excellent trout, and all the different varieties may be caught, including the very large *Salmo ferox*. Moreover, the fishing on many of the lochs is free. This makes Assynt with its innumerable lochs a veritable angler's paradise, but even better sport is to be found in other parts. The trout at Melvich, for instance, are particularly fine. Angling is one of the chief attractions of the hotels, which keep boats on the lochs, and in some cases have also the right of salmon-fishing, as at Lochinver, Rhiconich, Altnaharra, Melvich, and Forsinard.

All the large rivers, without exception, contain salmon, but the best are the Brora, Helmsdale, and Naver. There are at present three salmon hatcheries in Sutherland, at Loch Brora, Lochinver, and Kildonan, with outputs of 40,000, 20,000, and 900,000 fry respectively. Those at Inchnadamff and Scourie have been discontinued.

Many early travellers in Sutherland remark on the great abundance of salmon. Frank in 1638 states that the export of salmon from Brora amounted to £300 sterling. Captain Henderson in 1811 estimated the value of the salmon fisheries at £1750 sterling, but at that time they were let to merchants from the south, who caught the fish, and cured them in the boiling-houses which they established at several points. In the seven years 1851-7 there was an average annual take of 1715 fish of £508 value at Bonar on the Skibo estate. In general, the river fishings are let with the shootings, which makes it difficult to determine

their true value. The assessable values as returned for 1909 were: East Coast, £2160, North, £1300, West, £1317, and the total catch was 13,911 fish, including grilse, of which 2675 were taken by rod. These figures do not include the rivers of the Oykell basin, for which no returns are available, except the assessable rental £4315, which includes the Ross-shire fishings.

(*To be concluded.*)

THE PRINCE OF MONACO AND OCEANOGRAPHICAL RESEARCH.

By William S. Bruce, LL.D., F.R.S.E.

(*With Illustrations.*)

By the opening of the Oceanographical Institute in Paris on January 23rd, the Prince of Monaco has rendered unique service to the science of Oceanography.

The inauguration of the Institute in Paris marks the successful culmination of the Prince's efforts for the science of Oceanography during the past twenty-five years. Beginning his work in a small schooner—the *Hirondelle*—as a seaman and a fisherman, he soon found the craft too small for his aims and efforts; consequently he provided himself with an auxiliary steam schooner of some 500 tons register, and fitted her out completely for oceanographical research. In 1898, however, the extension of the Prince's researches compelled him to build a larger ship, and the *Princesse Alice II.*, a steamer of 1300 tons, capable of steaming thirteen knots, was built. On board this ship, which has more than once visited Scottish waters, the Prince has continued his work until the present day, when once again he finds himself compelled to build a new ship, not very much larger, but still more efficiently equipped. Side by side with this, during the last twelve years or more, there has been building on the noble rock of Monaco, the great Oceanographical Museum, which is a store-house and a treasure-house of the Prince's collections during his many voyages. To make the museum thoroughly efficient, two other small vessels have been attached—a small motor fishing-boat, the *Stella*, and a larger steamer, the *Eider*. These two boats are in charge of Dr. Jules Richard, for many years the Prince's valued scientific chief on board his yachts, and the able Director of the Oceanographical Museum of Monaco. Those who are familiar with the Prince of Monaco's work know the extensive and valuable publications that he has issued from the Oceanographical Museum at Monaco.

Not satisfied that his establishment was thoroughly complete, the Prince felt it necessary to build in Paris an Oceanographical Institute, which has just been opened. This fine building has for its object the retailing of the research work carried out on board the different ships

and in the Oceanographical Museum of Monaco, and for this purpose the work of the Institute centres round two Lecture Theatres—one for popular lectures, capable of accommodating 800 people, and a small one for the accommodation of eighty students, who are there for the special purpose of taking up Oceanography as a part of their special scientific course. There are three professors attached to the Institute—Professor Joubin, who devotes his attention to Biological Oceanography : Professor

The Oceanographical Institute at Paris.

Berget, who devotes his attention to Physical Oceanography ; and Professor Portier, who deals with the physiology of marine plants and animals. All three professors have for many years been associated with the Prince in his researches. The Director of the Institute is Dr. Paul Regnard. Each professor has his private apartment and an extensive laboratory of his own magnificently equipped with every necessity, and even many scientific luxuries. A photographic dark room and laboratory is attached to each of the three departments. The laboratories of

the professors are capable of accommodating several people, so that they can have plenty of room for research students. Besides this, there are some smaller laboratories which are set aside for specialists in oceanographical subjects, who desire to work at the Institute. These laboratories are for the free use of any scientific person of any nationality with proper credentials. There is also a good library.

Two big rooms are set apart for aquaria, one containing four large tanks, and the other containing many smaller tanks for the observation of animals and plants. An aseptic dissecting theatre forms an inter-

Professor Portier in his physiological laboratory.

esting part of the Institute, as well as a crematorium for disposing of organic waste products.

The theatre for public lectures is a "thing of beauty," a fine example of rich Florentine architecture, the work of M. Nénot, the architect of the Institute. It is decorated with mural paintings by the well-known French artist, M. Tenayr, representing different scenes in the oceanographical work on board the *Princesse Alice*,—the handling of the trawl, the examination of the freshly caught animals by the scientists and the artist, who is always one of the important people on board the yacht, and so forth.

In speaking of decorations one must specially notice the beautiful work of M. Léon Laugier, in his scheme of decoration for the secretariat. The secretary lives, as it were, in the sea, the walls and ceiling of his room representing scenes of animal life, living and moving in the sea, and culminating in a whirlpool in the centre of the ceiling, in the middle of which is a great cuttle-fish, with outstretched arms.

There is also a handsome Council Chamber, where the meetings of the Executive are to take place.

The Oceanographical Institute is composed of two sections—the Museum at Monaco and the Institute at Paris. There is a "Conseil d'Administration" and a "Comité de Perfectionnement." The former manages the business affairs of the Institute as a whole, whereas the latter is for the scientific guidance of the work of the Institute.

In an eloquent address at the inauguration, the Prince of Monaco pointed out that the Oceanographical Institute was at the same time French and International—French, because its seat is in Paris, and because the "Conseil d'Administration" is French ; International, because

Prof. Joubin's biological laboratory.

the men who take upon themselves the technical and scientific direction in the form of the "Comité de Perfectionnement" are chosen from the whole world without distinction of nationality, among savants who are most qualified in the science of Oceanography.

The Prince likened the Oceanographical Museum of Monaco to a ship anchored on the coast, filled with riches taken from the deep, and pointed out that he had given it as a bond of alliance to the savants of all nations.

The inauguration was altogether a most important gathering, and was presided over by the Prince of Monaco himself, who gave an account of the aims and objects of the Institute. It was graced by the presence of the President of the Republic and a brilliant assemblage of Members of the Home and Diplomatic Corps, as well as representatives not only of French, but also of foreign scientists ; Britain was represented by Sir

John Murray, Mr. J. Y. Buchanan, and the writer, all Members of the "Comité de Perfectionnement," of which the Prince of Monaco is President, and Mr. J. Y. Buchanan, Vice-President. It is not unworthy of notice that all three British representatives were associated with the work of the *Challenger* expedition, and in this connection the Prince made special mention of the important part Sir John Murray had played in the history of oceanographical research.

Situated in the heart of the Latin quarter of Paris, in close proximity to the Sorbonne, the Oceanographical Institute is destined to play an important part in the intellectual future of Paris. It has been erected on ground that was the old property of the monastery of the "Dames de Saint Michel," which was acquired in 1906 by the University of Paris, with the help of the State, of the City of Paris, and of the Prince of Monaco, to whom the University ceded a portion for the site.

Already, at the back of the Institute, the University is beginning to lay the foundations of its new chemical laboratories, and other academic buildings will occupy the rest of this magnificent and historic site.

The foundation of the Oceanographical Institute is a model which can well be followed, for it has not merely been the case of an individual placing a large sum of money at the disposal of others to suddenly build up such an institution, but it has been a gradual development of the labours of one man during twenty-five years, learning step by step what was necessary for the final and permanent establishment of such an institution.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

At a meeting of Council held on Monday, 13th February, the following ladies and gentlemen were elected Ordinary Members of the Society :—

Miss Georgina J. Gordon.	Miss K. I. Fleming.
Miss J. Russell Gunn.	Miss E. M. Barclay.
Major D. A. Wauchope, D.S.O.	George Sloan.
T. Archdale Pope.	Wm. B. Conochie.
Alex. Agnew.	Andrew Baxter.
Robert Hill.	T. B. Copeland.
Wm. Alexander Smith.	Archibald Lawson.
A. Stephen Cameron, Junr.	John Macdonald.

The following were elected Teacher Associate Members :—

Miss Elsie Shepherd.	Miss Margaret May.
Miss Jenny S. M'Innes.	Miss Marie Wells.

John T. Dunn, F.E.I.S.

Honorary Fellows.

Mr. Laurence Pullar, F.R.G.S., F.R.S.E., was elected an Honorary Fellow of the Society in recognition of his work in connection with the

Bathymetrical Survey of the Freshwater Lochs of Scotland, and Sir Ernest H. Shackleton in further recognition of his services to geography in Antarctic exploration.

Diploma of Fellowship.

The Ordinary Diploma of Fellowship was conferred on Mrs. Margaret K. Aitchison Robertson, M.D., L.R.C.P.E., a member of the Society.

Tenth International Geographical Congress.

The two honorary secretaries, Dr. J. G. Bartholomew and Mr. Ralph Richardson, W.S., and Miss Marion I. Newbigin, D.Sc., Editor of the *Scottish Geographical Magazine*, were appointed delegates of the Society at the tenth International Geographical Congress to be held at Rome from the 15th to the 22nd of October 1911.

International Polar Commission.

Sir John Murray, K.C.B., LL.D., Ph.D., and Mr. R. N. Rudmose Brown, D.Sc., or, failing either of these, Dr. William S. Bruce, were appointed delegates, and the two honorary secretaries deputy delegates, of the Society at the next Congress of the International Polar Commission, to be held at Rome on October 17th, 1911.

Scottish Exhibition of Natural History and Industry.

It was agreed to accede to the request made by Captain H. G. Lyons, on behalf of the Scottish Exhibition of National History, Industry, and Art, to be held at Glasgow in May this year, for the loan of old maps and atlases, and to a request by Dr. W. S. Bruce for the loan of portraits and relics for the same exhibition, the exhibition authorities undertaking that the articles lent shall be amply covered by insurance.

Lectures in March.

Mr. Howard Reed will address the Society in Aberdeen, Dundee, Edinburgh and Glasgow on the 7th, 8th, 9th and 10th of March respectively. The subject of his lecture will be "Cotton Growing within the British Empire."

It was hoped that the concluding lectures of the session in Edinburgh and Glasgow would be delivered by Mr. J. B. Tyrrell (Toronto), on March 23 and 24 respectively, but as Mr. Tyrrell is, unfortunately, unable to be present, his place will be taken by Captain H. G. Lyons, D.Sc., F.R.S., Lecturer on Geography in Glasgow University, who will make "The Valley of the Nile" the subject of his lecture.

GEOGRAPHICAL NOTES.

Europe.

Distribution of Forest Trees in the Maritime Alps.—Mr. L. F. Tessier contributes to *La Géographie* for 15th September last an interesting article upon this subject, based upon an investigation made by Mr. Salvador, which appears in the forestry journal called *Revue des Eaux et Forêts.*

The special interest of the subject is that the height of the Maritime Alps and their vicinity to the Mediterranean, together with the contrast between the impermeable crystalline rocks of the central massif and the calcareous beds at its periphery, combine to produce some extraordinary contrasts of vegetation, for the orange ripens its fruits within a horizontal distance of less than twenty miles of glaciers.

Three zones of forest vegetation can be recognised:—(1) the Mediterranean zone, with mostly evergreen trees, having leathery leaves: (2) the Mountain zone; (3) the sub-Alpine zone.

The trees included in the Mediterranean zone are, first, the Mediterranean Pine (*Pinus pinea*), which does not form extensive forests, but occurs on sandy shores near the sea, on alluvial soils, and also, near Fréjus, on the scanty soil lying above grits and pudding-stones of Permian origin. Then we have the Aleppo Pine, which is found on hot calcareous soils, associated with plants characteristic of the warmer parts of the Mediterranean, *e.g. Pistacia lentiscus* and the Carob. It is eminently suitable for the reafforestation of calcareous and marly soils. The Maritime Pine has the same predilection for siliceous soils that the Aleppo pine has for calcareous ones, but it ascends to a greater altitude. The Cork Oak similarly avoids calcareous soils, but it does not ascend above about 1900 feet. The Evergreen Oak is much less resistant to drought than the Aleppo pine, but is more resistant to cold. It is also an inhabitant of dry calcareous soils, especially those on a steep slope.

The Mountain zone includes, first, the Chestnut forests. The Sweet Chestnut, like the maritime pine, is restricted to non-calcareous soils, but it has a more limited vertical range than that tree. It neither descends so low, nor ascends so high, its zone being roughly the band between 1000 and 3000 feet. On the other hand it penetrates much more deeply into the chain than the maritime pine. The calcareous soils in the mountain zone are clothed by thickets of the Hop Hornbeam (*Ostrya carpinifolia*), an eastern species which finds its western limit in the department of the Maritime Alps. Above about 3500 feet it tends to be replaced by the Beech. On calcareous soils the Common Oak (*Quercus sessiliflora*) also occurs, replacing the evergreen oak of the Mediterranean zone in the upper zones. The Scotch Pine occurs on any soil, replacing other species, both in the upper and lower zones, whenever the conditions are unfavourable to them, especially in cold situations. The Beech is handicapped by its moisture-demanding nature, which makes it wholly unsuitable for the dry centre of the chain. It increases with the increase in moisture to the west, and is found especially in valleys open to the moisture-bringing west winds, while avoiding those open to the

south winds. As the direction of the valleys is determined by tectonic causes, it shows in consequence an interesting relation to the structure of the chain. The Silver Fir, less moisture-demanding than the beech, takes its place in the drier centre of the chain, and, where the insolation is not too great, it is able to descend on the cooler slopes below its natural limit of about 3000 feet, and it succeeds also at times in ascending to the sub-Alpine zone.

The trees of the third or sub-Alpine zone are the Spruce Fir, the Mountain Pine, the Larch, and the Arolla Pine. The zone is further characterised by the absence of the beech. In this zone there are no pure forests, all four species occurring in mixture. Both the mountain pine and the Arolla pine are rare, and, as usual, the natural zone of the larch lies a little higher than that of the spruce, which descends lower but finds its upward limit sooner than its companion.

Above the sub-Alpine forest zone occurs a true Alpine zone, devoid of forest trees, but having the usual Alpine plants.

America.

Artesian Waters of Argentina.—We have received the following communication from the Department of the Interior, U. S. Geological Survey.

"The climate of a part of Argentina is semi-arid, and the geological formations which are regarded as Quaternary and Later Tertiary are in the western and central districts of the country saline to a degree which indicates prolonged duration of aridity. The region of the Pampas which covers the province of Buenos Aires and stretches northward west of the Parana does not exhibit this characteristic, it having apparently long enjoyed a more humid climate, as it does now. The foot-hills of the Andes are also well watered. But with the exception of these last-named regions, a great part of the country suffers from lack of good water. This condition may, however, be in some measure relieved by proper development of artesian supplies. Many wells have been sunk already, but without adequate geological investigation. In the Pampas water is found at a general depth of 20 metres more or less, and is pumped to the surface by windmills. It may be said that the development of the livestock industry of Argentina would be impossible were it not for this supply, which comes from eolian, alluvial deposits of Quaternary and Tertiary age. A different geological condition exists from the Rio Colorado southward in what may be best described as northern Patagonia. In that region there are local elevations occupying a middle position between the Atlantic and Pacific, composed of granites and older rocks possibly of Paleozoic age, and rising to altitudes of 300 to 1000 metres. These mountains are not represented upon any map, and their distribution is not known, but they have been described by Moreno and other explorers. Upon their flanks there is an extensive formation of gray sandstone which attains a thickness of several hundred feet and is very porous. It slopes gently toward the Atlantic, and pure water flows from it in outcrops near the coast. The head of water in these strata is unknown. Further south in Patagonia the central sierra is replaced by

plateau country, and in Comodoro Rivadavia, in latitude 46° near the coast, wells which were sunk by the government in search of water developed petroleum. There is a large area in this region in which the geologic structure and the possibilities of artesian water need to be developed. In the great plains east of the Andes there are glacial deposits which may furnish superficial supplies like those of the Dakotas, and the marine Tertiary and Mesozoic strata afford conditions not unlike those of southern California. Here as well as in the valleys among the spurs of the Andes from Patagonia to Bolivia the geological structure is complicated and the problem of artesian water is one of peculiar difficulty as well as of great interest.

"Our present knowledge of these conditions rests upon reconnaissance work and the stratigraphic and paleontologic observations of the Geological Survey of Argentina. No work based upon topographic maps and systematic structure has as yet been undertaken. The problem is therefore one whose elements are as yet to be developed. The Argentine government is using every means to encourage settlement and development of the rich agricultural regions which lie in the zone of sufficient rainfall east of the Andes, and also in the vast grazing district of Patagonia. In order to afford ready communication it is building railroads at great national expense and operating them. The need of pure water for locomotive use as well as for other purposes has thus been made evident, and the Minister of Public Works, Señor Ramos Mexia, has adopted a plan for making surveys for the determination of artesian water conditions along the lines of national railways. He contemplates topographical and geological surveys of a character similar to those executed by the United States Geological Survey, from which he derived the initial suggestion. He last summer applied to the United States government for the services of a geologist and such assistants as he might need, and our government has responded cordially to that request. Mr. Bailey Willis has accordingly entered into a contract for the term of two years, to execute topographical and geological surveys for the specific purpose of ascertaining artesian water possibilities in those districts which the Minister may designate. With him are associated Mr. Chester W. Washburne of the United States Survey, Mr. J. R. Pemberton of Stanford University, and Mr. Wellington D. Jones of Chicago University, as geologists, and Mr. C. L. Nelson and Mr. W. B. Lewis as topographers, and the party sails shortly for Argentina to enter upon the work.

"While these surveys have a specific purpose, their possibilities of usefulness in developing the natural resources and encouraging settlement in the regions surveyed will not be overlooked, and the work will be founded on those scientific studies, upon which alone practical conclusions can safely rest. Thus it is hoped that a definite contribution to knowledge in geography and geology may be made.

"It is desirable to point out that the Argentine government has a geological survey which has been in existence since 1903 in its present organisation, and which dates back half a century as a bureau of mines. It is under the direction of Señor E. M. Hermitte, who is assisted by

Messrs. Bodenbender, Keidel, and Schiller, three German geologists who have done excellent stratigraphic and paleontologic work, particularly in districts of the central Argentine Andes. They have unfortunately not been supplied with maps. The established Bureau of Mines, Geology, and Hydrology is under the Minister of Agriculture. The surveys which are about to be made are undertaken by the Minister of Public Works. The two operations are thus officially distinct, but it is hoped and anticipated that they may be mutually helpful."

British Columbia.—We have recently received from the Agent-General for British Columbia a number of official publications dealing with the region, and including pamphlets on Agriculture, Fisheries, Mineral resources, Fruit-growing, and so on, which should be of great value to intending tourists and emigrants. The pamphlets are exceptionally well illustrated, and contain numerous maps. The relatively mild climate of British Columbia compares favourably with that of the rest of the Dominion of Canada, and Professor Macoun of the Geological Survey of Canada, states in addition that "there are 400 miles of coast-line in our western possessions clothed with a forest growth superior to anything else in the world at present, its shores indented with multitudes of harbours, bays and inlets, teeming with myriads of fish, its rocks and sands containing gold, iron, silver, coal, and various other minerals." He anticipates that these natural advantages will ultimately give British Columbia a value greater than that of Quebec, with "all the Maritime Provinces thrown in," and expresses his opinion that the climate is superior to that of England in every respect, both as regards heat and moisture.

Polar.

Japanese Antarctic Expedition (*with Illustration*).—A Japanese

The landing-party of the Japanese Antarctic Expedition. The leader is the central figure in the front row.

Antarctic Expedition has been organised and supported by public subscription. The leader of the Expedition is Lieut. Shirase, an ex-military

officer, and the party consists of twenty men, eight of whom are to accompany the leader on his sledge journey. The ship destined for the purpose is a sealer, and the name *Kainan-maru* (Exploring the South) was given to her by Admiral Togo before she left the Bay of Tokio on November 29, 1910. She sailed first to New Zealand, reaching Wellington on February 8, and leaving for the south on February 11, after coaling and taking in provisions. The party will endeavour to find out a suitable landing place along King Edward VII. Land, whence they will start on a sledge journey to the Pole. The great, perhaps sole, object of the expedition is to reach the Pole, and dogs are to be used in drawing the sledges. The funds available are very limited, at present amounting to £10,000. Count Okuma, who is the head of the Association for financing the expedition, is earnestly endeavouring to add to this sum.

General.

Meeting of the British Association.—The presidents of the various sections of the British Association have now been appointed for the Portsmouth meeting, which is to begin on August 30. The president of Section E (Geography) is Col. C. F. Close, R.E., C.M.G.: of Section C (Geology), Mr. A. Hacker, M.A., F.R.S.; and of Zoology (Section D), Prof. D'Arcy W. Thompson, C.B., of Dundee.

New Classification of Climates.—Professor Penck contributed to the *Sitzungsberichte d. kgl. preuss. Akad. d. Wiss.* for last year (xii-xiii) an article proposing a new classification of climates based upon the relations of land surfaces to precipitation. The journal named is not upon our list of exchanges, but the article is discussed in many recent geographical publications. We may note an English summary in the November issue of the *Bulletin* of the American Geographical Society, a German one in the *Geographische Zeitschrift* for November 22nd last, and a French one in the issue of *Annales de Géographie* for January 15th.

Professor Penck distinguishes three main groups as follows:—

I. The snow (*Nival*) climate, in which the larger part of the precipitation takes place as snow, and the amount which falls is greater than that removed by ablation, so that permanent snow is found, giving rise to glaciers. Beneath the glaciers a particular form of erosion occurs, but as glaciers extend beyond the region of the nival climate, this type of erosion occurs outside the climatic province. Two sub-types are distinguished here:

(*a*) The Nival climate proper, where all precipitation takes the form of snow.

(*b*) The Semi-nival climate, where rain sometimes falls.

II. The *Humid* climate, where the precipitation falls mostly as rain, and the amount is greater than can be carried off by evaporation, leaving a surplus which flows away in the form of streams and rivers. Just as glaciers flow from regions of nival climate into those of humid climate, so rivers may flow from the latter region into arid areas. The region of the humid climate lies between the snow-line and the aridity line or band

(Trockengrenze). The amount of rainfall necessary to produce a humid climate varies with the latitude, *i.e.* with the rapidity of evaporation. As a widely distributed climate its divisions are somewhat complicated. The following are recognised:—

(1) In the Polar division water and melting snow permeate the soil and cause it to freeze, rendering true springs non-existent. The ground is covered with snow during the winter months, and the rivers are frozen for the same period.

(2) In the Phreatic climate water penetrates the sub-soil and forms ground-water, giving rise to a special type of erosion, as contrasted with the Polar type. The subdivisions are as follows:—

(*a*) Sub-nival, which in winter resembles the Polar type, but where springs occur in summer.

(*b*) Humid climate proper, with a short-lived snow-covering, again subdivided according to temperature into the (α) temperate type, with winter snow, and rivers usually flooded during the colder season when evaporation is at a minimum; (β) equatorial climate, with no marked variations in temperature.

(*c*) Semi-humid climate, with well-marked dry and wet seasons, in the former of which the rivers disappear and arid conditions occur. Three subdivisions may be recognised: (α) sub-tropical, with winter rains; (β) monsoon, with summer rains, but with cold winters: (γ) tropical climate, summer rains, but practically no winter. In all parts of the humid region pseudo-arid regions may occur, with no surface-water, but here abundant ground-water is found.

III. The *Arid* climate, where evaporation removes the whole of the precipitation, and therefore no autochthonous rivers occur. Two divisions are recognised here:

(1) Semi-arid climates, with occasional heavy rain and temporary torrents. The water filters through the soil, and is drawn up again by capillary attraction, when it evaporates and leaves a crust of salts behind.

(2) True arid climates are those in which rain practically does not occur, and therefore where no surface crust of alkali, etc, can be found. Erosion is wholly mechanical, but often great. This climate is especially marked in the sub-tropical zone.

The Sargasso Sea.—Professor J. J. Stevenson contributes to *Science* for December 9 last an interesting note upon this subject, based partly upon personal observation, and partly upon material collected from ships' officers. He begins by quoting the descriptions of earlier observers, notably that of Maury, who describes an area of weed shaped like an hour-glass, and appearing firm enough to walk upon, extending from 19° to 66° W. long., the eastern portion from 17° to 30° and the western from 22° to 28° North lat. Carpenter limited the area more closely. In crossing the area during the journey from Barbadoes to the Azores the author noted the first seaweed just north of the twenty-first parallel, but this consisted of only a few isolated bunches. From this point the amount of weed increased until the

twenty-fifth parallel was crossed, but throughout the bundles of weed were isolated, and not more than 5 to 18 inches in diameter, though they were sometimes fifty feet long. Even in the places where the weed was thickest there were large spaces entirely free from it. By the time the twenty-seventh parallel was reached, in long. 41° 36′ W., practically all weed had disappeared. On the return voyage similar conditions were observed.

Two officers who had crossed this particular area of ocean many times stated to the author that patches of weed exceeding one-half to one acre were very rare, and that the amount of weed varied greatly, being largest when the trades are weak, and least when they are strong. Most of the weed appears to be torn from the Bahamas, and swings round these islands.

It has been suggested that the decay of the weed in the Sargasso Sea might give rise to the formation of coal on the sea bottom, but the author is of opinion that the amount of organic material derived from this source must be quite insignificant, and that the total amount of weed present has been exaggerated.

EDUCATIONAL.

In the Report on the ninth International Congress of Geography, published here in vol. xxiv., we referred very briefly (p. 538) to a scheme for the publication of an atlas of views illustrating the various forms of erosion, a scheme which formed the basis of a paper by Professor Emile Chaix of Geneva. The suggestion aroused much interest, and ultimately a resolution was brought forward asking for the support of the Congress, the scope of the atlas being enlarged to cover Terrestrial Relief in general. Formal approval was given by the meeting of delegates, and a committee was formed which was entrusted with the task of presenting to the tenth Congress a completed scheme, and also some published plates as examples. The committee consists of Professors Emile Chaix, J. Brunhes, and E. de Martonne, and in preparation for the Congress at Rome its members have now put forward definite proposals, which are embodied in a circular[1] which has been sent to us.

These proposals are as follows. The photographs composing the atlas are to be published in the form of quarto plates, each of which will contain one or two views. Each plate will be accompanied by a sheet of letterpress of the same size, which will contain a brief description of the plate, a topographic map showing the exact point at which the view was taken, and also a section or a block diagram like those employed by Professor Davis and others. The plates will be issued in sets, and will be classified either systematically or according to regions. The publication of some 500 to 600 plates is contemplated, and the publication would be spread over a dozen years. It is suggested that the plates should be sold at a

[1] *Atlas Photographique des Formes du Relief Terrestre.* Lyon, 1910.

franc a-piece, or 50 francs for a set of 100, but the exact figure depends upon the support which is given to the scheme. It is hoped to publish first two sets including about twenty plates, dealing with (1) forms directly influenced by tectonic conditions, faults, folding, etc., and (2) forms affected by glaciation. The members of the committee solicit photographs bearing upon these subjects, and especially communications from those who would be willing to subscribe to a first issue of one hundred plates, or to several batches of one hundred. We have been further informed by Prof. de Martonne that a specimen fasciculus, composed of some 8-10 plates, is to be published soon.

The atlas, if completed, will prove of such enormous value to teachers, who will find in it representations of all the known forms of surface relief, that we take this opportunity of recommending the scheme to their notice.

NEW BOOKS.

EUROPE.

Linlithgow Palace: Its History and Traditions. By Rev. John Ferguson, D.D., F.S.A. (Scot.), Minister of Linlithgow. Edinburgh and London: Oliver and Boyd, 1910.

To his former work *Ecclesia Antiqua: The Story of St. Michael's Church*, Dr. Ferguson has now added this careful and scholarly history of the noble palace which was built by James I., intimately associated with many dramatic scenes in the tragic history of the Stuart line, and finally burned by the alleged carelessness of the Duke of Cumberland's troops in 1746. Since then it has received the spasmodic attentions of the Board of Works in the way of concrete, red cement, and miscellaneous repairs; but there seems no prospect that Scotland will ever raise the sum of £50,000 required to restore what Lord Rosebery has called "the Windsor of Scotland." Dr. Ferguson is not a dogmatic antiquarian, and he does not claim absolute historic truth for two propositions, which he regards as probable. First, that James I. built a complete quadrangled palace exactly on the present site; and second, that Linlithgow Bridge was the scene of Queen Mary's abduction by Bothwell. The author would not be human if he did not enjoy his exposure of the mistake made by Chalmers, Dickson, and Burnett with regard to the Holyrood Charter and the Ancient Royal Manor House of Linlithgow. Some things are certain; *inter alia*, that Edward I. spent the winter of 1301-2 in Linlithgow (this being his fourth visit); that James IV. (who greatly altered the Palace) and his Queen Margaret were especially kind to Linlithgow; that James V. (who was born in the Palace) added the new gateway, the long south gallery, and the fountain; that Queen Mary was also born there, and afterwards visited it four times; that James VI. spent a considerable time at the Palace in 1585, because there was a plague in Edinburgh, and afterwards came to it from England in 1617, when he was presented with an address, written by the poet William Drummond, and spoken by the local schoolmaster, placed inside a plaster box which the Magistrates had constructed for the purpose (!); and that it was occupied by Royalty for the last time when Charles I. slept there in 1633. Since then the history of the Palace has been one, first of neglect, and latterly of gradual decay. It was proposed to use it as a barracks, and then as a county hall, and lastly in 1893 it was

used for the purposes of a church bazaar! In 1911 Lord Rosebery proposed the rehabilitation of the Palace as a National Memorial of King Edward VII., but this idea also has failed to strike the imagination of the country.

The photographic illustrations of the book, consisting mainly of views of the Palace from various points, are excellent.

In the Rhône Country. By ROSE G. KINGSLEY. London: George Allen and Sons, 1910. *Price* 10*s.* 6*d. net.*

In this beautifully illustrated volume Miss Kingsley descants with generous enthusiasm on the beauties of the Rhone valley between Lyons and Arles. She brings to her task a considerable knowledge of the ancient history of the many important cities which are situated in the valley, *e.g.* Vienne, Valence, Avignon, and of the many quaint legends connected with both the ecclesiastical and secular history of the tract. She is an adept in describing the architecture of the many buildings, the remains of which even now inspire awe in the spectator, and enable him to picture to himself the magnificence and splendour of times long gone by. The sketches are based on letters written home during the course of the six weeks' trip, and will be welcomed by those who have already visited Provence. It would seem as if Miss Kingsley's object in publishing these letters was to divert the stream of tourists from the Rhine to the Rhone. "Again and again I asked myself" (she says) "why lovers of the beautiful do not flock to visit—and paint—the Rhône instead of the Rhine. With its real mountains, its extraordinary picturesque towns, its rich and varied vegetation, its intense yet pale colours, the French is ten times finer than the German river. And if castles are needed to please the sentimental traveller, they may be found by the dozen, perched on every hill-top, on every rocky point"; and it would not be surprising or regrettable if this book had that effect. Miss Kingsley, we need hardly say, does not compete with Baedeker, but she has much useful information to give to the tourist about places and sights which might escape his notice, such as the famous rose-gardens in the vicinity of Lyons or the champagne factory at St. Péray; and her remarks about, and experiences of, various hotels may be noted.

From Irish Castles to French Châteaux. By NORMA BRIGHT CARSON. London: T. Werner Laurie, 1910. *Price* 3*s.* 6*d.*

At one place in this book Mrs. Carson says, "I am dealing with impressions, with atmospheres, with ghosts, and with the sentiments to which associations give significance." This is a very accurate indication of how she has treated the subjects of the book. We have here her impressions of cities, such as Edinburgh, London, and Paris, scenes such as Burns's country in Ayrshire and Scott's country about Melrose and Dryburgh, and buildings such as York Cathedral and Versailles. There is nothing new or original about them, but the volume is well illustrated, and as she writes with genuine enthusiasm, and avoids trenching unnecessarily on Baedeker, it may find a large circle of readers, more probably on the other side of the Atlantic than on this.

The Isles of Scilly: Their Story, their Folk, and their Flowers. Painted and described by JESSIE MOTHERSOLE. London: The Religious Tract Society, 1910. *Price* 10*s.* 6*d. net.*

Some time ago there appeared an advertisement in the "agony" column of one of our newspapers, in which inquiry was made as to the existence of any summer quarters where there is no golf. We do not know what replies were sent, but certainly the Scilly islands, a few hours' sail from the coast of Cornwall, might be

instanced as so blessed. According to Miss Mothersole, these islands are a latter-day Arcadia, where the cultivation of flowers is the chief industry, and the pastime of the inhabitants is a wreck! "Scillonians" (she says) revel in a wreck, just as the soldier loves a battle and the fireman loves a fire. The love of wrecks is in their island-blood." In this beautifully illustrated volume we have a number of pleasantly written sketches, in which Miss Mothersole gives us much information about the past history and present condition of these islands. But the principal feature of the book is the illustrations in colour, which merit exceptional commendation and will ensure for the volume a large circle of readers.

Some Sylvan Scenes near Glasgow. By T. G. F. Brotchie, F.S.A. (Scot.). Glasgow: Aird and Coghill, Ltd., 1910. *Price* 1*s. net.*

This little book consists of a series of sketches which have appeared in a Glasgow paper, and describe eighteen Saturday afternoon rambles in the vicinity of that city. The descriptions are well illustrated by sketches by the author, and are enlivened by the retelling of many old legends and stories connected with the different localities visited. Many of the descriptions are exceedingly interesting, and the book will be found very useful to pedestrians living in Glasgow.

Bohemia and the Čechs: The History, People, Institutions, and the Geography of the Kingdom, together with Accounts of Moravia and Silesia. By Will S. Monroe, author of *Turkey and the Turks*, etc. Illustrated. London: G. Bell and Sons, 1910. *Price* 7*s.* 6*d. net.*

This book is more for the student of history than of geography, but as a contribution to general literature it has very considerable value. The chequered history of Bohemia is related in a stirring manner, and the account of present conditions cannot fail to be of benefit to any one interested in the tangled conglomeration known as the Austrian Empire. The author shows that Bohemia, even although it has no coastline, is a distinct geographical unity, and one wonders whether circumstances will ever arise through which it will regain that political independence warranted by its physical isolation. A map of the country even on a small scale would have been a useful addition to an otherwise admirable set of illustrations.

Home Life in Hellas. By Z. Duckett Ferriman. Illustrated. London: Mills and Boon, Limited. *Price* 8*s. net.*

We can cordially recommend the volume now before us to any of our readers who are thinking of visiting Greece. The author has evidently devoted much time, and has spared no trouble in the study of his subject, and he has compiled for his readers a considerable amount of detailed information regarding the present-day life, manners, customs and doings of the inhabitants of modern Greece. As his information was acquired first hand, *i.e.* by residence in the country, it is quite up to date. Hellas, if we are to accept Mr. Ferriman's account of it, though a delightful country to visit, is by no means a country where one would care to reside. In the important matters of sanitation and education, it is very far behind. The rites and ceremonies of social, domestic and religious life of to-day are deeply influenced by the superstitions of pre-Christian paganism. In politics there is no attempt at consistency or stability, and the professional politician is rampant. There is not much gaiety, even in the capital, Athens. To the visitor, however, there are always the famous history and traditions of the past connected

with practically every nook and corner of the mainland and the islands. Mr. Ferriman enlivens the volume with a number of personal incidents, anecdotes and historical allusions, and he shows himself well versed in the literature of his subject.

ASIA.

Islam in China. By Marshall Broomhall, M.A., Editorial Secretary, China Inland Mission. London: Morgan and Scott, Ltd., 1910. *Price* 7*s.* 6*d. net.*

In this remarkable and interesting book we have an instructive and carefully stated presentation of one, and an exceedingly important one, of the many and various grave problems which are summed up in the question, What is to be the future of China? It is superfluous nowadays to descant on the huge area of the Chinese empire, its four hundred millions of population, its want of education, its former misgovernment, and so forth. A wiser course is to endeavour to elicit the real facts and truth about the present condition of the nation or congeries of peoples which make up the Chinese empire, so that we may have some trustworthy data on which to base a sound judgment as to the present and possibly also as to the future. This volume shows us something of the difficulty of this task. It deals with only one section of the people, viz., the Mahommedans; and the first question the writer had to face was how many Mahommedans are there in China and how are they distributed. There are no official statistics, and although Mr. Broomhall may look forward hopefully to the time when the Imperial Government will authorise a census, repeated experience in India has shown that even there where the conditions were much more favourable than those of China, the statistics of the first authorised census were very erroneous. If we recollect rightly the population of Lower Bengal alone was understated by several millions. Many prejudices, many fears, many suspicions have to be overcome among the people of the East ere they can be persuaded, or cajoled, or coerced into sending in truthful returns; and a skilled and successful census staff is not easily collected together, especially in the Far East. Mr. Broomhall, however, evidently made serious and conscientious efforts to get at the truth. He inquired from more than 800 persons throughout the length and breadth of China, and collated the replies of the 200 who answered him, with the result that he estimates the numbers of Mahommedans now in the Chinese empire as "somewhere between the minimum and the maximum figures of 5,000,000 and 10,000,000." Of course Mr. Broomhall does not claim for the estimate anything like accuracy, and probably the only safe deduction to be made from his figures is, that the Mahommedan population now in China is very much less than was hitherto believed, and this holds good even if we assume Mr. Broomhall's maximum figures. Mahommedans are to be found in every province of the empire. Nearly three-fourths of them are stated to reside in the provinces of Kansu, Chili, Yunnan, and Sinkiang; and unquestionably within the last twenty years they have had their share of the political, economic, social, and religious unrest which has been so much in evidence in the East. This is probably not their own doing, as they are, if we may believe Mr. Broomhall, "more hated and more restricted in their liberty than they have ever been before." But they are useful and opportune as pretexts for whose protection and interests foreign powers may interfere in the government of the empire. Mr. Broomhall refers to this, but it is a matter obviously outside the scope of this *Magazine*; and so is the religious aspect, *i.e.*, the duty of Christianity to Islam in China, so ably stated, and so forcibly and earnestly pleaded by Mr. Broomhall.

That Islam as a militant and missionary religion is the most formidable rival of Christianity at the present day is a fact frankly acknowledged on all sides at the World Missionary Conference held in Edinburgh last June; but judging from Mr. Broomhall's account of it we gather that its propaganda is relatively much more active and successful in Africa than in China. We can hardly accept the dictum in the preface that this work is "based on thorough investigations and scientific criticism of sources," but we cordially recommend it to our readers because unquestionably Mr. Broomhall has made a valuable contribution to the literature of the subject, and to our knowledge of the past and present conditions of Islam in the vast Chinese empire.

The Call of the Snowy Hispar. By William Hunter Workman, M.A., M.D., F.R.G.S., etc., and Fanny Bullock Workman, Officier de l'Instruction Publique de France, F.R.S.G.S., etc. London: Constable and Company, Ltd., 1910. *Price* 21*s. net.*

In this handsome and beautifully illustrated volume Dr. and Mrs. Workman, who are of course well known to our readers, describe the sixth and last of their expeditions among the lofty and magnificent peaks of the Himalayas north of Kashmir and north-west of Baltistan. They had with them in this expedition their trusty and experienced Italian guide Savoye, and three of their former porters, and two young doctors, fresh from the University of Fribourg. Starting in the end of May 1908, they marched from Srinagar *viâ* Gurais, the Burzel Pass, Astor, and Bunji, and reached Gilgit; thence they marched *viâ* Chalt to Nagar, where they were received in state by the Mir, and the final preparations for the expedition were arranged. On the 1st July they reached Hispar. The object of the expedition was to explore the famous Hispar glacier and its tributaries. Dr. and Mrs. Workman had explored the adjoining regions in previous expeditions, but had been unable to descend to the glacier. On this occasion they most successfully accomplished their intention, and explored the glacier and its tributaries from end to end. The Hispar is the most northerly of a group of four great glaciers, the waters of which find their way into the Indus, and was found to be between thirty-five and thirty-six miles in length, with an average width of about two miles. It is surrounded by lofty and inaccessible peaks, some of them over 22,000 feet in height, and of surpassing magnificence. The exploration was accomplished without mishap; but the narrative, and still more the illustrations, bear testimony to the arduous and dangerous nature of the work, and to the courage, skill, and perseverance of every member of the party. Dr. and Mrs. Workman experienced plenty of the inconveniences which seem inseparable from exploration in the Himalayas,—unimportant, and, some of them, even ludicrous perhaps when read in an armchair a long time after they have happened—but serious and critical at the time of occurrence. But their former experience and their imperturbable sang-froid and fertility of resource did not fail them, and, as we have already said, the exploration was successfully accomplished without mishap. The story is remarkably well told, and is full of interest and excitement as a tale of exploration, as well as being a treasury of scientific information regarding a comparatively little-known tract of the Himalayas. At the conclusion of the book there is a special chapter in which the claim of Mrs. Workman to hold the altitude-record of her sex is triumphantly vindicated against that of Miss Peck. The subject was referred to briefly in the July number of this *Magazine* last year. It is described in greater detail in this volume. We have already mentioned the many fine illustrations in this work, but we must add that in artistic merit they

are second to none that have appeared in any of the numerous works devoted to mountaineering within the last decade. The two maps which accompany the work also deserve a note of commendation.

The Face of Manchuria, Korea, and Russian Turkestan. By E. G. Kemp, F.R.S.G.S., Author of *The Face of China.* London: Chatto and Windus, 1910. *Price 7s. 6d. net.*

Following on her previous book, *The Face of China*, which was noticed in the *Magazine* (vol. xxv. p. 659), we now welcome Miss Kemp's latest story of travel, which is contained in the present handsomely got up and illustrated volume. The journey was made in company with the same lady friend who was her travelling companion across the Chinese Empire, and the outward route taken was by the Trans-Siberian railway to Mukden, the capital of Manchuria, thence through the peninsula of Korea by rail, and across it on pony-back. The latter part was an adventurous trip for the two ladies, and one which called for a good stock of pluck and endurance to enable them to face the discomforts of native inns and villages, and the pertinacious curiosity of the country folk. Miss Kemp was impressed by the general air of prosperity and well-being which she saw on this part of her journey, the Korean village streets being swept daily, while the cattle looked sleek and well cared for. She found the country people not particularly friendly, but the standard of cleanliness was higher than one would expect among an indolent people like the Koreans. Speaking of the Japanese occupation of the country, Miss Kemp writes, "the Japanese have, practically speaking, taken possession of *everything* in the most high-handed manner; they have dispossessed the Koreans of all riparian rights, of fishing, game shooting, of the coasting trade, of large quantities of land, for which a purely nominal price had been given, and which the Koreans have been forced to sell contrary to their wishes. The railways, post, and telegraph, the currency, taxation and customs, are entirely in their hands; what is left for them to appropriate? The bitterness of the bondage is aggravated by the fact that so few of the Japanese trouble to learn the language, so that misunderstandings constantly arise. They have given different names to the places, even to the capital. The courtesy, which is such a universal characteristic of the Japanese at home, he has left behind." The Koreans lost a good friend in Prince Ito, and Miss Kemp remarks on the strange irony of fate shown in the fact that his murderer was a Korean.

In the chapter on Mukden will be found a brief account of the rise of the Manchu dynasty, and of Noorhachu, its founder, whose grandson was the first Manchu Emperor of China. As a companion to this, we would specially mention that part of Miss Kemp's account of her brief run through Russian Turkestan which deals with the home of "Tamerlane the Tartar," the ancestor of Baber, who founded the Mogul Empire in India in 1525.

In "The History of Roman Catholicism in Korea" (chapter ix.) we have a brief sketch of the story told in Père Dallet's *Histoire de l'Eglise de la Corée* of the persecutions and martyrdoms suffered by the French missionaries and their converts, and of the success of the Catholic missions to-day. Miss Kemp seems to have been in close touch with Protestant missionary friends throughout her journey, and has much to tell of their work. The influence of the Scottish Medical Mission in Manchuria cannot be overestimated.

On the return journey from the East, Miss Kemp made a rapid run through Russian Turkestan, and, although she was not permitted to deviate from the line of the railway, she visited Tashkent, Samarkand, and Bokhara, of which three cities she gives a vivid impression with both pen and pencil.

The water-colour sketches which adorn the book call for special praise, and the whole forms an exceedingly readable and interesting account of travel in parts which are little visited.

AFRICA.

La Conquête du Sahara: Essai de Psychologie politique. Par E. F. Gautier. Paris : Librairie Armand Colin, 1910. *Price* 3 fr. 50.

M. Gautier's study in political psychology consists of six separate essays, connected only by the fact that all deal with some aspect of the problems presented by the French Sahara. The book is written with considerable philosophic detachment, and is enlivened by much Gallic wit. The general conclusion is that the French colonies have increased in spite of the action of the central authority, rather than because of it, and have owed their increase to the force of circumstances, rather than to the deliberate policy of any group, commercial or political. This is not only true in the Sahara, for elsewhere also France has been a conqueror in spite of herself. M. Gautier adds that he is not certain that even in other countries colonial expansion has been voluntary and clearly conscious of itself. "One seems to perceive dimly mysterious laws not yet formulated."

Apart from the philosophy of colonial expansion, the book contains some passages of definitely geographical value. We note especially the interesting account of the camel considered in its relation to life in the desert, and the discussion of the Saharan oases, and of the value of the Sahara as a whole. In regard to this last point, the author adopts a moderate view, intermediate between those of the pessimists and optimists. The direct utility of the region must, he thinks, always be small, but he is of opinion that it may have an increasing indirect utility. Thus he lays great stress upon the fact that the Sahara offers a possible means of communication between the developing Sudan and the northern states of Africa, and believes that a Trans-Saharan railway would one day justify itself.

Uganda for a Holiday. By Sir Frederick Treves, Bart., G.C.V.O., C.B., LL.D. London : Smith, Elder and Co., 1910. *Price* 9s. *net.*

Those of our readers who have followed Sir Frederick Treves in his travels in India and in the West Indies, will be delighted to accompany him again in this charming account of a holiday excursion to Uganda. It is true he never left the beaten track, but he tells the story of where he journeyed and what he saw with a lucidity and freshness which have an undefinable charm. Never dull or uninteresting, he can invest even such a hackneyed incident as the railway journey across France with the same interest which he infuses into an account of some wild scene, such as a dance of naked Waheia at Bakoba on Lake Nyanza. The narrative of his railway journey from Mombasa to Port Florence, and round the famous lake from which the Nile issues, is enlivened by historical reminiscences of many romantic and ofttimes tragic events, which occurred in the course of the last half-century, while this part of the Dark Continent was being explored. Keenly appreciative of the beauties of nature, and sincerely sympathetic with the savage races with which he came in contact, he succeeds in portraying them clearly to his readers without overloading the picture. An admirable illustration of this is his description of the scenery of the Gessi Islands and Lake Nyanza and the desolation caused by the scourge of sleeping sickness. We may add that his lucid diagnosis of the origin and course of this once obscure disease can be easily understood by all. The book is illustrated by abundance of good photographs, and is equipped with an excellent map. We very cordially recommend it to the perusal of our readers.

Nigerian Studies: or the Religious and Political System of the Yoruba. By R. E. Dennett. London: Macmillan and Co., Limited, 1910. *Price* 8*s.* 6*d.*

Mr. Dennett has collected in *Nigerian Studies* much valuable information with regard to the religious and political conceptions of the Yoruba inhabitants of the Western Province of Southern Nigeria. Readers of his earlier book, *At the Back of the Black Man's Mind*, will find in this book further illustration of the author's theory that all the black man's conceptions with regard to the material and spiritual world may be referred to certain numerical formulae. But apart from this theory, which underlies the whole of Mr. Dennett's work, much of the material collected here is of great interest.

In dealing with the history and traditions of Yorubaland the author is unable to account clearly for the superiority of the Yoruba to neighbouring tribes, as indicated not only by the development of agriculture and other arts among them, but also by the advanced form of government, even in those native states of Yorubaland which have not assimilated their institutions to those of the Colonial Administration. A fuller account of the history of the people would have been welcome, for present conditions, institutions and beliefs have undoubtedly been deeply affected by the long period of native wars, to which a brief reference only is made.

Mr. Dennett explains that the arrangement of the book follows the order of the Odas or palm-nuts used in divination by the priests of Ifa, the oracular deity of the Yoruba, and the order of the seasons, which, with their clear divisions, determine the course of the primitive lives of the hunter, the fisher and the farmer. It is not easy to see the advantages of this method of exposition, which involves in some cases a want of connection in the treatment of subjects: thus we are given in the eighth chapter some account of Ifa and in the fifteenth chapter a farther account filling in some details.

In the seventeenth chapter Mr. Dennett deals with the subject of the Native Land Laws. He quotes a number of authorities in support of the contention that among the Yorubas land is inalienable and vested in the head of the community. He indicates the difficulties introduced by the premature acceptance of the idea of private ownership of land. Throughout the book Mr. Dennett urges the necessity for the careful study of the native customs and institutions.

Islam Lands. By Michael Myers Shoemaker. New York and London: G. P. Putnam's Sons, 1910. *Price* 10*s.* 6*d. net.*

Mr. Shoemaker is at once an experienced traveller and an experienced book-maker. In this, his last publication, he takes us to familiar ground in Egypt and Tunisia, and describes with his usual easy freshness of style scenes on the Nile from Assuan to Khartum. In connection with the latter place he tells us over again, with many caustic comments and reflections on the vacillation of Mr. Gladstone, the mournful story of the death of General Gordon. In Khartum he had some interesting talk with Slatin Pasha and with others who had special knowledge of the circumstances amidst which the hero died. From Khartum he made his way to Tunis, and the second half of the book might be described as a pæan on the delights of motoring in Tunisia. For the roads constructed by the French in their North-African colony he has unstinted praise. The party in three weeks visited Carthage, Tunis, Kairwan, Timgad, Biskra, Algiers and Oran, regarding most of which places Mr. Shoemaker has something historical or legendary, descriptive or personal, to tell us, so that although there is little or nothing that is novel, still the interest of the narrative does not flag. Our

readers to whom the places mentioned in this book (and there must be many of them) are familiar, will be glad to have their recollections refreshed by the crisp, vigorous and entertaining narrative of Mr. Shoemaker. The book is embellished with many beautiful photographs, some of them taken by the author.

AMERICA.

Labrador: Its Discovery, Exploration and Development. By W. G. Gosling. London: Alston Rivers, Ltd., 1910. *Price* 21*s. net.*

In writing this book the author has evidently had two ends in view. The first has been to collect and preserve all the information available relating to the past history of Labrador, from the time of the much-disputed visit of the Norsemen from Greenland down to the present day. The historical narrative has for the most part been woven round the character and achievements of those who have taken the most prominent part in the discovery or settlement of the country, *e.g.*, the Cabots, Jacques Cartier, Sir Hugh Palliser, and Captain George Cartwright. Considerable attention is paid to the work of the early voyagers and also to the occupation of the country by the French, the Americans, and the English. A useful summary is given of the boundary dispute with Canada, but perhaps the most valuable chapter in the book is that which treats of the cartographical evolution of the country, and in it the author has some very suggestive criticisms to pass on the various maps to which reference is made. The photographs of several of these ancient maps are certainly among the most interesting illustrations in the volume. Thus, scattered through the five hundred pages of the book, the student of geography on its historical side will, no doubt, find much interesting and useful material, but the author has purposely made no attempt to give an exhaustive treatment of his subject either from the scientific or the descriptive point of view. Here and there may be found casual references to the customs of the natives and the mode of life imposed upon them by their physical surroundings, and in the chapter dealing with British fisheries a little is said concerning the economic possibilities of the country and the hindrances to its development. In compiling this book the writer has evidently been much more concerned with the second end he has had in view, namely, to furnish a record of missionary effort in Labrador and to give a laudatory account of Sir Wilfrid Grenfell's work there. It cannot be said that the attempt to achieve two such widely divergent aims is altogether successful; it is not satisfactory from the geographer's point of view to whom it is rather disconcerting to find on the same page a discussion of the natural resources of Labrador and of the spiritual needs of the natives.

The author has made good use of the historical documents and official reports to which he had access, but much of the material could have been compressed with advantage, for sometimes a whole document is reprinted when a few extracts from it would have served the purpose; again a good deal of the matter must be considered rather irrelevant from whatever standpoint the book is judged. The book has been very carefully indexed and is supplied with a large map of Labrador based upon the most recent surveys.

The River and I. By John G. Neihardt. With 50 Illustrations. New York and London: G. P. Putnam's Sons, 1910. *Price* 7*s.* 6*d. net.*

This book, we believe, will find more numerous and more appreciative readers on the other side of the Atlantic than on this. The work of "the Nebraska poet,"

it is written in turgid, inflated, highfalutin language which is eminently distasteful, at least in Great Britain. Here is a sentence taken from near the beginning of the book which purports to describe the river Missouri in flood. "To fight this cruel, invulnerable, resistless giant that went roaring down the world with a huge uprooted oak-tree in its mouth for a tooth-pick! This yellow, sinuous beast, with hell-broth slavering from its jaws! This dare-devil boy-god that sauntered along with a town in its pocket, and a steepled church under its arm for a moment's toy!" If any of our readers care for some 200 pages of this sort of thing, they will find them in *River and I.* We must also add that there are many beautiful photographs of scenery, etc., on the Missouri.

The Channel Islands of California. By Charles Frederick Holder. London: Hodder and Stoughton, 1910. *Price 7s. 6d. net.*

This volume of 400 pages, with 150 beautiful illustrations and 12 maps, is addressed to the angler, sportsman and tourist, and is well calculated to make his mouth water. Every one has heard of the leaping tuna, and this book about it and its home, the Channel Islands of the Pacific Coast, will appeal to all who are fond of travel and sport. What Madeira, the Riviera, and the Azores are to Europe, the Channel Islands of California have become to the United States. Mr. Holder here tells the intending traveller how to get there, and how to make the most of his opportunities when he reaches the islands. The climate is described in this sentence: "From May to October, the idler, angler, golfer, sportsman or health-seeker will not experience a squall or rainstorm,—comfortable, beautiful days following one another. And then the sport! while the islands offer facilities for various sports—golf, coaching, hunting, mountain climbing, and diversion for the botanist and archæologist, their fame has been made by the extraordinary sea-angling with rod and reel, the region being, apparently, the meeting-ground of many great game fishes caught nowhere else, and many indigenous to the locality. Here is the leaping tuna, the long-finned tuna, the yellow-fin, the white sea bass, the tarpon, the yellowtail, and many more, any one of which would make any place famous, and to catch which scores of anglers cross the Atlantic yearly."

But the interest of the islands is by no means confined to the prodigious records of the anglers. Here are plants and land animals of species found nowhere else. Here are the remains of a great and powerful barbaric civilisation. There is some fine descriptive writing in the chapters on San Clemente, Santa Cruz, Santa Catalina, and the chapter entitled "The Ancient Islanders" is as well done as anything of the same kind in literature.

AUSTRALASIA.

Eastern Pacific Lands, Tahiti and the Marquesas Islands. By F. W. Christian, author of *The Caroline Islands.* London: Robert Scott, 1910. *Price 7s. 6d. net.*

By his book on the Caroline Islands Mr. Christian proved himself a skilful investigator and interpreter of Micronesian peoples and customs. Moving westwards under the spell of Robert Louis Stevenson, he spent some time in the Society and Marquesas Islands, and devoted himself to the study of a fast vanishing race. As a student of comparative philology his aim was to collect the root-words of the various languages in order to strengthen the grounds for the theory —now well established by Mr. Christian's efforts—that the various Polynesian dialects spring from the Aryan tree. The causes of the approaching extinction of

these interesting peoples are still in doubt. Those usually cited—the introduction of the diseases of civilisation, of European clothing, the encouraging of profligacy—seem scarcely sufficient. May it not be simply that the race is exhausted, and that the process of depopulation would have gone on to its inevitable end even without any foreign intervention at all? The book is well illustrated with photographs and maps.

GENERAL.

Physical and Commercial Geography. By Herbert Ernest Gregory, Albert Galloway Keller and Avary Longley Bishop. Boston: Ginn and Co., n.d. *Price* 12*s.* 6*d.*

In spite of its double title and triple authorship, this work is characterised by a distinct unity of aim, that unity being expressed by the sub-title, "A Study of Certain Controlling Conditions of Commerce." It is, in fact, a commercial, or perhaps we had better say, an economic geography, nearly all the matter coming under the head of physical geography having a relation to geography under the aspect just named. The distinctive feature of the book is that about three-fifths of the whole is devoted to general considerations under the heads of natural environment (Part I.), and the relation of man to natural conditions (Part II.), and the remaining two-fifths to a study of geographical conditions as illustrated in separate political divisions. In the first two parts, however, the reference to the dominant subjects of the book is maintained with remarkable consistency, there being very few pages indeed, that have not a distinct relation to the economic geography of the globe. The general chapters are remarkably well done, although, perhaps, here and there, one might perhaps have desired a little fuller treatment. Under the head of climate, for example, there is only a very brief reference in a paragraph on mountain climates to the influence of altitude upon climate. There is no paragraph upon plateau climates as contrasted with mountain climates properly so-called, and thus there is no general heading under which reference can be made to such facts as that, on the one hand, wheat can be grown in the western states of America, and in Canada, at an altitude at which it is impossible to grow that cereal in corresponding latitudes in western Europe; that the limit of grain cultivation in the Upper Engadine is nearly 1000 feet higher than in the lower Rhine Valley, and, on the other hand, that in certain valleys of the Alps settlements are found upon the slopes of the hills instead of at the bottoms of the valleys, on account of the greater cold of winter in the valley bottoms; that various crops in the Alleghanies are more or less confined to what is called the "Thermal Belt" at a certain height up the hill sides; and that the citrus belt of California is driven from the low grounds to an altitude about 500 feet or so above the sea-level on account of the prevalence of cold fogs at the lower altitudes; and similar cases elsewhere.

Occasionally also there are general statements that might be the better for a little revision. On page 82, for instance, reference is made to the obvious advantages of rivers as boundaries of political divisions, in illustration of which we are told that "the medial line of the St. Lawrence" separates Canada from the United States, but there is no reference to the serious, perhaps the more serious, disadvantages of rivers as political boundaries as, it may be mentioned, may be illustrated by the fact that the St. Lawrence is not throughout a boundary between Canada and the United States, and in numberless instances in Europe, China, and other parts of the world, where boundaries have grown up in accordance with actual geographical conditions, and have not been settled by armchair geographers, or armchair politicians who are not geographers. On

page 111, again, we find the statement that the equatorial belt is characterised by a uniformly heavy precipitation, a statement, of course, that is true for only portions of the equatorial belt, as the reader may learn from other portions of this volume.

In treating of the means of commerce, we are inclined to think that the authors are disposed to attach an exaggerated importance to canals, and we think it can only be in consequence of this tendency that they call attention to (p. 327) the Erie Canal as a striking example of a canal which has been able to withstand the competition of the railway, seeing that there is little evidence of that canal having been able to do so under normal conditions. If the Erie Canal had not been constructed and maintained by the State of New York, and thrown open to carriers in the end free of charge, it is very doubtful whether it would have been able to meet the railway competition even to the extent that it has done.

In the political portion of the work, a peculiar feature is that only three of the great political divisions of the world are dealt with in detail, namely, the United States, the British Empire, and the German Empire, the aim being to treat each of these portions of the world with a sufficient degree of fulness to illustrate the nature of all the geographical conditions that have to be taken into account in a study of economic geography. The idea is good, but we do not think that the selection of countries is a happy one. To treat the British Empire as a unit in the same sense as the United States and the German Empire hardly takes into account the actual geographical conditions. The "foreign possessions" of both the United States and the German Empire are foreign possessions, and the conditions affecting their commerce and general economic development can be determined by the central government of the United States and Germany respectively, but it is not so in the case of the British Empire. Such favours in the way of trade as are accorded by one member of the British Empire to another have been granted solely by the governments of the self-governing colonies, and if any general agreement as to trade between the different parts of the Empire is ever brought about, that must be the result of elaborate negotiations between members of the Empire, which, so far as these matters are concerned, are on the footing of independent states. On page 351, Canada, Australia and India are all explicitly referred to as possessions of the British Isles. Now, while Canada, for instance, is proud to be a member of the Empire, it is certainly very far from regarding itself as a possession of the British Isles, and would probably resent being classified as such along with India. Among minor errors we may note the confusion of Norwich with Norfolk upon page 363. But in spite of any objections that may be made to this work in places, and some of those on which we have ventured relate to points on which opinions will differ, it cannot be too emphatically stated that this volume is one that will be highly valued by all those who are interested in the subject of which it treats. We have only to add that the value of the text is greatly enhanced by numerous maps and illustrations, as well as by an index of twenty-five pages.

Whitaker's Almanack for 1911. London. *Price* 2*s.* 6*d.*

Whitaker's Peerage, Baronage, Knightage, and Companionage for the Year 1911. London.

Hazell's Annual, 1911. Edited by Hammond Hall. London: Hazell, Watson, and Viney, 1911. *Price* 3*s.* 6*d. net.*

These useful volumes show their customary features, and we shall limit our notice to a brief account of the special references to geography and geographical exploration. In *Whitaker's Almanack*, under the heading of "Geographical Progress and

Geographical Changes, 1909-10," we have four closely-printed pages, including two small sketch maps. It is unfortunate that a misprint occurs in the index as to the paging of this article, which makes it a little difficult to find, for it contains a careful and accurate account of the chief geographical events in the year under discussion.

In *Hazell's Annual* we have the usual summaries of scientific progress, geography being allotted rather over two pages. The smaller space allows room for less detail than is given in the previous article, but within the limits of the space the account is clear and full, and will be found exceedingly useful for reference. In both volumes, in addition to the articles specified, there is a great mass of material which the geographer will find useful or indeed necessary, while the third publication mentioned above will be of value to him in his capacity as a member of a highly organised and complex community.

BOOKS RECEIVED.

Catalogue of Photographs of Geological Subjects (Memoirs of the Geological Survey of Scotland). Prepared by the Geological Survey and Museum. Demy 8vo. Pp. iv + 62. *Price* 6*d.* Geological Survey, Scotland, 1910.

Scrambles in Storm and Sunshine among the Swiss and English Alps. With 4 Illustrations by R. C. Armour, and 28 Photographs taken by the Author. By E. Elliot Stock. Demy 8vo. Pp. 210. *Price* 6*s. net.* London: John Ouseley, Ltd., 1911.

The Nations of the Modern World: an Elementary Study in Geography. By H. J. Mackinder, M.A. With 189 Illustrations and 8 pages of Coloured Maps. Cr. 8vo. Pp. xvi + 319. *Price* 2*s.* London: George Philip and Sons, Ltd., 1911.

The Junior Scientific Geography. Book I—Physical Geography. By Ellis W. Heaton, B.Sc., F.G.S. Cr. 8vo. Pp. viii + 160. *Price* 1*s.* 3*d. net.* London: Ralph Holland and Co., 1911.

The Bernese Oberland in Summer and Winter: a Guide. By Julian Grande, F.R.G.S. With Illustrations and Maps. 12mo. Pp. 201. *Price* 3*s.* 6*d. net.* London: Thomas Nelson and Sons, 1911.

Corruption and Reform in Hungary: A Study of Electoral Practice. By R. W. Seton-Watson, D.Litt. (Oxon). With numerous Documents. Demy 8vo. Pp. xvi + 197. *Price* 4*s.* 6*d. net.* London: Constable and Co., Ltd., 1911.

The Toll of the Arctic Seas. By Deltus M. Edwards. Illustrated by G. A. Coffin, and from Photographs. Demy 8vo. Pp. x + 449. *Price* $2.50 *net.* New York: Henry Holt and Co., 1910.

Guide to Palestine and Syria. With 13 Maps and 6 Plans. Globe 8vo. Pp. xxxi + 164. *Price* 5*s. net.* London: Macmillan and Co., Ltd., 1910.

An Unknown People in an Unknown Land: An Account of the Life and Customs of the Lengua Indians of the Paraguayan Chaco, with Adventures and Experiences met with during Twenty Years' Pioneering and Exploration amongst them. By W. Barbrooke Grubb. Demy 8vo. Pp. 330. *Price* 16*s. net.* London: Seeley and Co., 1911.

The Commercial Handbook of Canada and Boards of Trade Register. Seventh Year, 1911. Edited by Ernest Heaton, M.A., and J. B. Robinson. Cr. 8vo. Pp. 540. *Price* 5*s.* Toronto: Heaton's Agency, 1911.

The Khalifate of the West, being a General Description of Morocco. By Donald Mackenzie. With Map and Illustrations. Demy 8vo. Pp. xiv + 274. *Price* 10*s.* 6*d.* London: Simpkin, Marshall, Hamilton, Kent and Co., Ltd., 1911.

Europe and its Peoples (Lands and their Stories. Book V). By H. W. Palmer, with Appendices by David Frew, B.A. Cr. 8vo. Pp. 288. *Price* 1*s.* 8*d. net.* Glasgow: Blackie and Son, Ltd., 1910.

Swiss Mountain Climbs. By George D. Abraham. With 24 Illustrations and 22 Outline Drawings of the principal Peaks and their Routes. Cr. 8vo. Pp. xv + 432. *Price* 7*s.* 6*d. net.* London: Mills and Boon, Ltd., 1911.

Seventeen Years among the Sea Dyaks of Borneo: A Record of Intimate Association with the Natives of the Bornean Jungles. By Edwin H. Gomes, M.A., and an Introduction by the Rev. John Perham, with 40 Illustrations and a Map. Demy 8vo. Pp. xx + 343. *Price* 16*s. net.* London: Seeley and Co., Ltd., 1911.

Among Indian Rajahs and Ryots: A Civil Servant's Recollections and Impressions of Thirty-seven Years of Work and Sport in the Central Provinces and Bengal. By Sir Andrew H. L. Fraser, K.C.S.I., M.A., LL.D., Litt.D. With 33 Illustrations and a Map. Demy 8vo. Pp. xv + 368. *Price* 18*s. net.* London: Seeley and Co., Ltd., 1911.

Otahité: au Pays de l'éternel Été. Par Henri Lebeau. Cr. 8vo. Pp. xviii + 259. *Prix* 3 *fr.* 50 *c.* Paris: Librairie Armand Colin, 1911.

Across the Roof of the World: A Record of Sport and Travel through Kashmir, Gilgit, Hunza, the Pamirs, Chinese Turkestan, Mongolia, and Siberia. By Lieut. P. T. Etherton, F.R.G.S., F.Z.S., 39th Garhwal Rifles (Indian Army). With Map and Illustrations. Demy 8vo. Pp. xvi + 417. *Price* 16*s. net.* London: Constable and Co., Ltd., 1911.

Australia in its Physiographic and Economic Aspects (The Oxford Geographies). By Griffith Taylor, B.A. Camb., B.Sc., B.E. Syd., F.G.S. Cr. 8vo. Pp. 256. *Price* 3*s.* 6*d.* Oxford: Clarendon Press, 1911.

The Mediterranean Cruise; describing all Mediterranean points usually visited in a Winter's Cruise in Europe, Asia, and Africa. Compiled by Bruce Millard. Illustrated chiefly from original photographs. Cr. 8vo. Pp. xii + 438. *Price* 9*s.* New York: G. P. Putnam's Sons, 1910.

Physiography. By Rollin D. Salisbury. Demy 8vo. Pp. xx + 770. *Price* 21*s. net.* London: John Murray, 1908.

Europe. Vol. II—The North-West (Stanford's Compendium of Geography and Travel. New Issue.) By Geo. G. Chisholm, M.A., B.Sc. (Edin.). Maps and Illustrations. Cr. 8vo. Pp. xxviii + 742. *Price* 15*s.* London: Edward Stanford, 1902.

Report on the Administration of the Civil and Military Station of Bangalore for the Year 1909-10. Bangalore, 1910.

Report of the Trade of India (East India), 1909-1910. London, 1911.

Report of the Administration of Burma for the Year 1909-10. Rangoon, 1911.

Diplomatic and Consular Reports.—Trade and Commerce of Florence, 1909 (4619); Trade and Commerce of Norway (Supplementary), 1909 (4620); Trade of the Consular District of Tangier, 1909 (4621).

Colonial Reports (Annual).—Straits Settlements Report for 1909 (663); Trinidad and Tobago Report for 1909-10 (664); Southern Nigeria Report for 1909 (665); Mauritius Report for 1909 (666); British Honduras Report for 1909 (667); St. Vincent Report for 1909-10 (668); East Africa Protectorate Report for 1909-10 (669); Uganda Report for 1909-10 (670); British Guiana Report for 1909-10 (671).

Publishers forwarding books for review will greatly oblige by marking the price *in clear figures, especially in the case of foreign books.*

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

THE PROPOSED TRANS-PERSIAN RAILWAY.

By Lieut.-Col. A. C. Yate.

(With Sketch-Map.)

We are indebted to Mr. Rudyard Kipling for the sentiment "East is East and West is West and never the twain shall meet," but when we turn the searchlight of history on to this epigrammatic couplet, we find that the handiwork of man has been from time immemorial directed to drawing the twain closer and closer. Our earliest available records, so far as I am aware, show that the caravan by land, and the sailing ship by sea, conveyed men and merchandise alike from the east and from the west to those great ports and cities which by geographical position had become the central marts of the civilised world, viz. :—Tyre and Sidon, Carthage and Alexandria, and the capitals of the "Great Oriental Monarchies" which flourished in the centuries before and after Christ between the valleys of the Tigris and Euphrates, and those of the Oxus and the Indus. Later, Rome, Constantinople, Baghdad, Bruges, Venice, and Genoa monopolised this trade, and finally, with the discovery of the Cape route, it passed successively into the hands of the merchant adventurers of Portugal, Holland, and Great Britain. If proof be needed of Arab maritime skill and power, let me mention that the Arabs established their naval supremacy in the Levant within thirty years of the Hijra (*vide* Muir's *Caliphate*) by signally defeating the Byzantine fleet.

The Scottish historian, Dr. Robertson, has collected in his monograph on *India* much curious and interesting information elucidating the early intercourse between east and west, and I believe I am right in saying that by sea the Phoenician and Arab mariner, and by land the inhabitants of the Arabian and Central Asian Steppes, were quite at

home in the ports and marts of the Far East, when as yet the Caucasian races had no direct commercial intercourse with the lands of Cathay and Ind. With ever-varying conditions and under the auspices of ever-changing nationalities this traffic by caravan and sail continued, until the invention and development of steam power suggested the possibility of more rapid methods of communication. It seems quite clear that at least 2000 years before M. de Lesseps immortalised his name, the Pharaohs and Ptolemies established and maintained a navigable water route, connecting the Red with the Mediterranean Sea; but under Arab rule this route fell into disuse. Locomotion by steam suggested to two men, Chesney and Waghorn, the possibility of vastly accelerating communication between Europe and Asia. The former devoted all his energies to the Euphrates Valley, the latter to the desert between Alexandria and Suez. The statue of Waghorn, as the pioneer of the "Overland Route," stands, I believe, on the scene of his labours. The memory of Chesney is perpetuated in print only. For more than forty years now, the Suez Canal has been the great channel of communication between East and West. During the last decade, German enterprise has been busily employed in pushing forward a railway from Haidar Pasha, opposite Constantinople, across Asia Minor to Baghdad.

It was the genius of Beaconsfield which bought from Ismail Pasha every Suēz Canal share that he (the Pasha) held, and thus gave to Great Britain direct power of control over a waterway of vital importance to British commerce: and again, it was the genius of Beaconsfield which would, after the Berlin Conference of 1878, have inaugurated the construction of a railway from Alexandretta to Koweit. Cyprus, garrisoned by British troops, covered the Bay of Iskanderun; the Persian Gulf was then, as now, policed and patrolled by British men-of-war; Messrs. Lynch and Co. monopolised the river traffic between Baghdad and the mouth of the Shat-el-Arab, and Turkey at that moment, if ever since the Crimean War, looked upon England as a genuine friend. However, Mr. Gladstone returned to power in 1880, and the projects of General Chesney and Mr. W. P. Andrew were left for Germany to realise a quarter of a century later. The scheme which at the conclusion of the Berlin Conference commended itself to Lord Beaconsfield as being, in the interests of the British Empire, sound, is now being carried out by a German syndicate.

During the thirty-two years which have elapsed since that Conference the balance of power in the Near and Middle East has undergone important modifications; and although various schemes have from time to time been put forward for connecting Europe by rail with India, these have all now been concentrated in three main railway systems, all of which will, I think, in process of time be completed.

These are:—

(1) The railway from Constantinople, via Konia, Adana, and Baghdad to Koweit.

(2) The railway from Baku across Persia and Baluchistan to a junction with the North-Western State Railway of India.

(3) A line connecting Russian Turkestan through Afghanistan with the North-West Frontier of India.

This last-named line, though long talked of, must await for its completion the good-will of the Amir of Kabul. The question of railway construction in Afghanistan is not directly connected with the subject-matter of this paper, but its possibilities are so far-reaching that we may well devote a moment or two to considering what its future is likely to be. While the Amir preserves his suspicious and conservative attitude, progress will be going on all round his dominions. The system of railways in Russian Turkestan is connected by Orenburg with Russia direct, by Samarkand and Krasnovodsk with the Caucasus, and by Andijan with the western borders of China. A branch from Merv to Kushk leads to within sixty miles of Herat.

It is more than twenty years since I travelled along the Trans-Caspian Railway from Uzunada to Samarkand, and thence by tarantass to Tashkent. General Sir James Hills-Johnes was my companion, and General Annenkoff, who journeyed with us as far as Samarkand, proved a most kind and helpful friend. Since that time the Turkestan railway system has undergone both extension and improvement (the wooden bridge, for instance, over the Oxus at Charjui, which we crossed at a cautious snail's pace in 1890, has been replaced by a steel girder bridge on granite piers), but one project which, as I have always understood, was cherished by General Annenkoff does not appear to have been as yet even begun. I refer to a line connecting the Trans-Caspian Railway via Vernoe and Semipalatinsk with the Trans-Siberian Railway probably at Tomsk. I gather, however, from occasional references in the Press, that this line, serious undertaking as it may seem to be, is not lost sight of in Russia; but I think that the political pressure of the hour is impelling that Power to think more of railway expansion in a southerly than in an easterly or northerly direction. The same active brains that designed and carried out the railways in Turkestan and Siberia have projected possible extensions not only into Western China, but even as far as the valley of the Hoang-ho, and, if so far, then to the shores of the Pacific.

The era of railway activity has now begun in earnest in China, but I must confess that I regard the Thian Shan mountains and the vast Gobi desert as obstacles which will retard the construction of a through line from Tashkent to the Great Wall for a good many years. Other extensions which were contemplated a few years ago by the Russians in Central Asia were from Charjui and Samarkand to Kilif on the Oxus opposite Balkh, and even the difficulties of the Hindu Kush failed to discourage dreams of a railway from Kilif to Kabul. The line from Kushk to Kandahar has, we know, long been a desire of the Russian heart.

Let us turn now to the eastern and southern sides of Afghanistan. Of our Indian railways we need only say that they are ready to cross the Afghan frontier, whenever the Amir sends them an invitation to do so. I cannot but believe that he will ere long realise that railways are

essential to the prosperity of his kingdom and the aggrandisement of his throne. He must see that he wields a power not less to-day than that of the Shah of Persia, and yet at the Courts of Europe he is not represented. A potentate who closes his own frontiers and his own court to foreign nations cannot expect to be so represented. He keeps wealth, moreover, from his doors, and wealth is power.

If the Trans-Persian railway is constructed, I think that in course of time Mashhad and Herat, and also Kerman and Kandahar, either via Farah or by the valley of the Helmand, will be connected by rail. This is not an exhaustive sketch of the railway possibilities which are in a measure waiting on the Amir's will, but enough, I think, has been said to show that at no very remote date the most distant parts of Europe and of Asia will have railway communication with and through Afghanistan.

In view of the circumstances of his own day, the Amir Abdurrahman was right in warning his heirs and his subjects against the admission of railways, until such time as the military power of Afghanistan sufficed to render invasion improbable: but since his day there has been a notable change in the political situation of the Middle East. Placed as he and his son Habibullah Khan have been for thirty years between the Russian and the Indian Empires, their policy has been perforce a strictly defensive one. But the advent of Germany as a powerful factor in the politics of the East has materially altered the relations between Great Britain and Russia, and so relieved the strain on Afghanistan. In the important debate which was raised in the House of Commons on January 22, 1902, by Mr. Joseph Walton, the first hints were given of the policy which culminated five years later in the now familiar Anglo-Russian Convention of 1907. When the terms of that Convention were first made public, they met, as might be expected, with searching criticism, but at the end of four years' experience of its operation we may reasonably admit that the preservation of the integrity of the kingdom of Persia and Afghanistan is no less compatible with existing conditions than it was when Great Britain and Russia sat watching each other's every move with ultra-jealous eyes. The Amir of Afghanistan received and has kept without comment his copy of the Convention of 1907. There is nothing to show that so far it has affected his policy: but I think that in time, when a round dozen or so of railway termini are touching his frontiers, he will be unable to resist their seductive conveniences, and then Kabul, Kandahar, Herat, and Mazar-i-Sharif will appear in Bradshaw's Continental Guide, and lines formerly closed to the British traveller will enable Indian officials to make the most of their privilege leave.

Lectures given before the Central Asian Society, by Colonel Picot on "Railways in Western Asia," by Colonel Beresford on "Russian Railways towards India," and by Mr. Charles Drummond Black on "A railway from the Mediterranean to India," will be remembered by most of us, and the discussions which followed the lectures are full of valuable suggestions. I may add that many lectures delivered before that Society, notably those by the Earl of Ronaldshay, General Sir E. F. Chapman,

Mr. H. F. B. Lynch, Mr. Lovat Fraser, and Mr. Dunn, incidentally embrace much information on this subject. Further, I need hardly remind my readers that in Mr. Chirol's *Middle Eastern Question* and in Sir Thomas Holdich's *The Gates of India* much is said on the same subject, and to all these I acknowledge with sincere pleasure my indebtedness for the assistance which they have afforded me in preparing this paper. Among other authorities whom I have consulted I may mention Lord Curzon's *Persia*, Mr. W. P. Andrews' lecture on "The Euphrates Valley Railway Route," delivered in 1873 at the Royal United Service Institution, and Sir Wm. Willcocks' lecture delivered in November 1909 before the Royal Geographical Society on "Mesopotamia; Past, Present, and Future"; at the last moment, too, when I had already sent my MS. to be typed, I came across a lecture delivered by Captain Lakin, Indian Army, at the Staff College, Quetta, in July 1909. Almost every line of railway I have mentioned is laid down on the plan which accompanies his paper, excepting that from Trebizond to Tabriz, and from Kerman via Kandahar to the Gomal. This lecture is published in the *Journal* of the United Service Institution of India, for July 1910, and appears to be the result of careful study.

I propose in this paper to consider briefly the Trans-Persian Railway scheme from the geographical, commercial, and financial points of view. I am not struck with the happiness of the name "Trans-Persian" for the suggested route, and considering that it follows closely the Indo-European Telegraph Line through the Caucasus, Persia, and Baluchistan, I think that "Indo-European" would be the more appropriate title. In this paper, however, I adhere to the term "Trans-Persian."

It is more than probable that this will be the first railway to reach India direct from Europe. The present attitude of the Amir precludes the idea of an early connection between the railways of Russian Turkestan and those of the north-west frontier of India, and in no sense would the term "Indo-European" be applicable to the Turco-Teutonic Railway which is intended to traverse Turkey-in-Asia from the Sea of Marmora to the Persian Gulf. I say this without any prejudice to the opinions of those who consider that Great Britain is entitled to settle direct with the Turkish Government the conditions on which the section of the Baghdad Railway from Sadiye to Koweit shall be constructed, opinions with which I have the strongest sympathy. Lord Curzon's historic denouncement of the Minister who would grant to a foreign Power a port on the Persian Gulf may appropriately be extended to the Government which fails to uphold the time-honoured rights of Great Britain on the Tigris and the Shat-el-Arab. Since the days when our chartered companies persuaded the Dutch and the Portuguese to transfer their enterprise elsewhere, we have practically monopolised the trade of Southern Persia and Turkish Arabia through the Persian Gulf. We have kept law and order in that Gulf at the expense of our money and our men. H.M.S. *Hyacinth* at Debai is the last witness to the truth of this. We have developed all the trade-routes, notably that of the Karun River, debouching on the Gulf; and

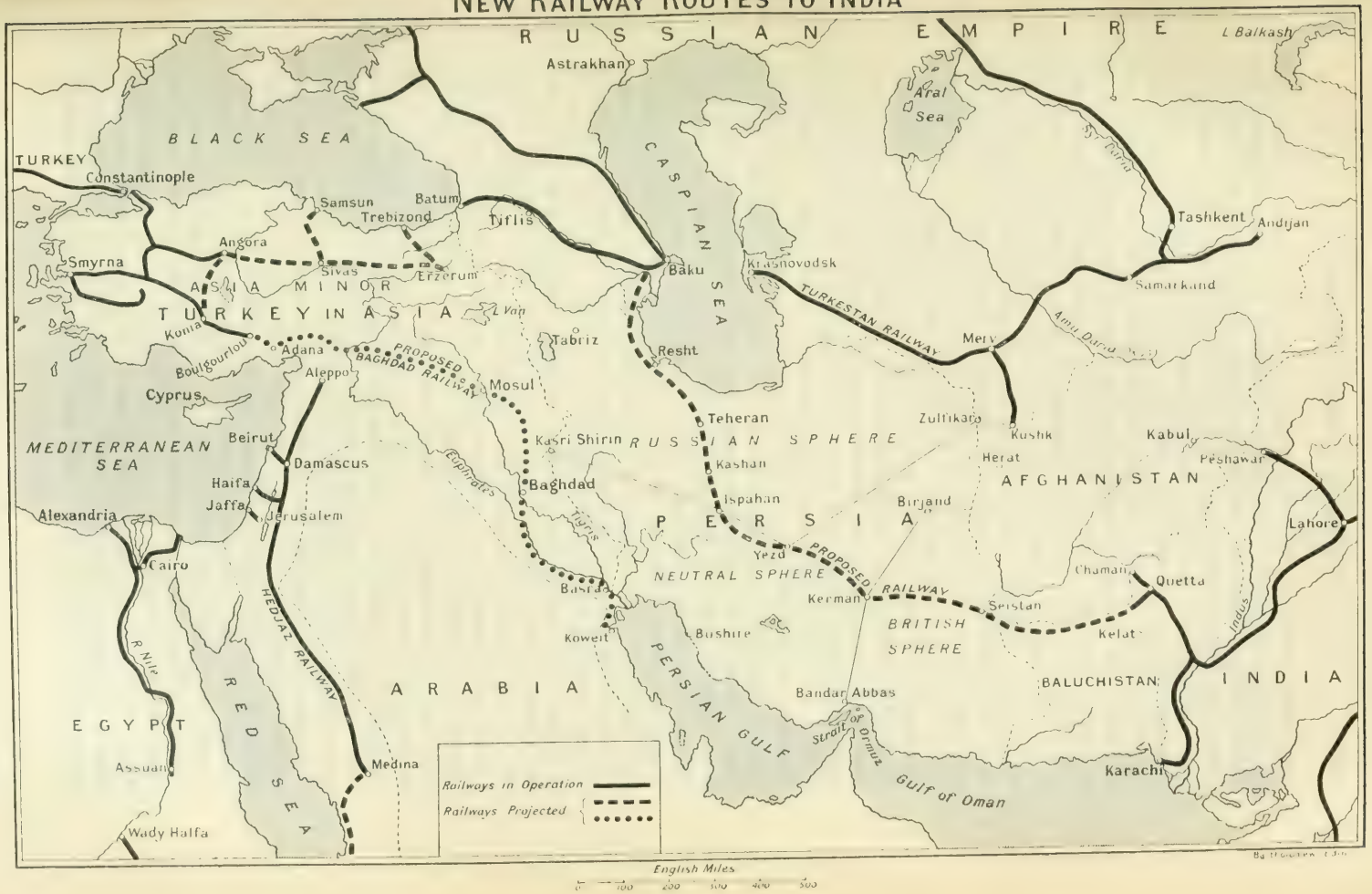
it is our travellers who, for more than a century, have opened up this, till recently, imperfectly-known country to the more civilised world.

The Potsdam negotiations have put Turkey on her mettle. She may employ German capital and engineering talent to make her railways, but the control of them is hers. I am told that the employees on the Anatolian Railway and on that section of the Baghdad Railway which is now open are French-speaking Levantines, and that German colonists in Asia Minor are forbidden by the Turkish Government.

On the 21st November 1910 the *Times* and the other daily papers published a communication made to Reuter's Agent regarding the Trans-Persian Railway, by M. Svegintseff, a member of the Duma, and one of the Russian promoters of the railway, who had just arrived in London. The pith of these communications, put forward officially in the name of the Russian promoters, is—(1) That the company shall be international: (2) That its chief office shall be in London, Brussels, or some western city; (3) That English and Russian rights shall be equal, the participation of other groups being invited on terms to be defined hereafter: and (4) that the service of the line shall be from Calais to Calcutta, using existing lines, and passing through Persia. The length of the line to be constructed from the Caucasus to the Indus Valley is put at 1600 miles, the cost is estimated at £21,000,000, and the period of construction at four years. It is assumed that Nushki will be the point of destination on the Indian side, but that assumption, as I will show later, is not at all a safe one. The length of the journey from London to Bombay is put at seven days, the distance being 5700 miles, and the cost of the railway ticket at £40. Incidentally we are reminded that the P. and O. charge £60 for a fourteen days' journey. All Anglo-Indians regard the P. and O. as a great national institution—one to be proud of; but they would regard any incentive to reduction of fare or acceleration of speed applied to that company as a kindly interposition of fortune in their favour.

The visit of M. Svegintseff was followed early in December by that of M. Timiriazeff, president of the Russo-British Chamber of Commerce, and a member of the Russian Imperial Council of State. During his stay in London, I had the pleasure of half an hour's conversation with him. He told me that he did not consider that any definite move in the matter could be made until, at least, the present month (February), and that, as we see, has proved to be the case. The *Times* correspondent telegraphed from St. Petersburg, on January 29th, that the Council of Ministers had approved the Trans-Persian railway scheme, provided that it involved no outlay by the Treasury and no serious damage to Russian trade. I can only trust that, amid the Constitutional changes which must largely absorb the attention of both Houses of Parliament, the quieter atmosphere of the Foreign Office and of the City may find the leisure and peace to consider the political and financial aspects of this proposed railway. The most influential organs of our Home and Indian press appear to be distinctly disposed to favour this scheme, and, speaking for myself, I think it is a very fascinating one, but if it promises advantages, it also involves risks.

New Railway Routes to India



I propose now to trace the probable route of the Trans-Persian railway from its starting-point in the Caucasus to its terminus in the Indus Valley. The Russian railway system running southward from St. Petersburg and Moscow crosses the river Don at Rostov, and passing by Vladikavkas and Petrovsk arrives at Baku. It is this line which the Russians propose to extend into Persia. At first sight it would seem more natural to extend the line already built from Tiflis to Julfa onward to Tabriz and Teheran; but there is an obvious geographical objection to this. The great range of the Caucasus passes between Vladikavkas and Tiflis, and although an excellent road by the Dariel Pass connects these two points, Russian engineering skill and finance have not yet ventured to cope with the very difficult and costly task of connecting these two places by a railway. I may also add that there is a possible strategic reason why Russia prefers the Resht to the Julfa route. The former is secure from attack: the latter is within reach of the Turkish frontier. The Trans-Persian Railway, then, will take off from a point on the Baku-Tiflis line about fifty miles south-west of Baku, and from there will be carried along the west shore of the Caspian to Resht, and thence, ascending the valley of the Safid-Rud, cross the Elburz Range to Kasvin, and then follow the well-known postal route via Teheran, Ispahan, and Yezd to Kerman. It is generally agreed that the engineering task between Resht and Kasvin is a difficult one, and will involve heavy expenditure. This line, though the most convenient, and indeed at present the only possible one for direct communication by land with Russia, will not adequately serve the traffic of the Black Sea. The bulk of the imports and exports of Persia pass through the ports of Batum and Trebizond. It is practically certain that the Russian Government will extend the line which connects Batum, via Tiflis, with Julfa, so as to join the main line already described at Kasvin. The Tiflis press in November last strongly urged this extension, arguing that all British and German trade for Northern Persia would then come to Batum. This is to ignore Trebizond. The construction of a railway between Tabriz and Batum is a matter which in the main concerns the Turkish Government; but Trebizond, if it is to compete with Batum, must also be connected by railway with Tabriz. The Trans-Persian Railway is international, and all that affects its welfare should be regarded and treated from the international point of view. The Trebizond route is of great importance to Persia. Russia objects, it is said, to a Turkish railway from Trebizond to Erzerum and thence to Tabriz on strategical grounds. International interests can hardly accept "strategical grounds" as being a valid excuse for robbing an international railway of its profits. Russia has not offered to make Batum a free port. If the Trebizond-Tabriz line is not to be laid, and if Batum is not to be a free port, the interests of the International Trans-Persian Railway will assuredly suffer, and that to benefit Russia only. On the 23rd November last the merchants of Moscow loudly protested that those of Great Britain and Germany would gain more by the proposed railway than they themselves would. M. Klemm assured them that they would be well cared for, but that Imperial policy must prevail.

This agitation on the part of the Moscow Chamber of Commerce has since been renewed and met with some support from the Ministry of Ways and Communications. Russian political and commercial policy are, it seems, not at one in regard to this Trans-Persian scheme. To my thinking the Moscow grievance is illusory, perhaps designedly so. This railway gives to Russian trade access to the markets of Central and Southern Persia, and promises no certain *quid pro quo* to British commerce. It may possibly obviate the prolongation of the Baghdad Railway along the head of the Persian Gulf, but if Great Britain should take Mesopotamia under the ægis of her protection, we may look upon such prolongation with more equanimity than we can at this moment. We in the Persian Gulf and Indian Ocean, as everywhere, maintain the policy of the "open door." Russia should respond in the Black Sea. In July 1885, I went to Batum and found earthworks in course of construction. Russia was then fortifying Batum in defiance of the Treaty concluded at Berlin in 1878. In 1886 Batum ceased to be a free port.

The second important point raised between Russia and Germany is the construction of the branch connecting the Persian main line, via Kermanshah, with Khanikin, to which point the Baghdad Railway Syndicate holds the right of laying a branch line from Sadiye, a place situated some twenty to thirty miles above Baghdad on the Tigris. British rights in Southern Persia and in Turkish Arabia, as before pointed out, are so well established that they are entitled to a just meed of attention. Barely five years ago, before the Central Asian Society, Sir Thomas Gordon and Sir Lepel Griffin spoke of the country between Kermanshah and the Karun River as "districts which would add to the granaries of the world." It was an Englishman and a member of that Society, Mr. Arthur Taylor, working for an English firm, Messrs. Lynch & Co., who opened up the Karun River route, and it is fully as reasonable that the produce of this region should find its way, via Ahwaz, to Muhamra, as, via Khanikin, to Sadiye. More so, in fact, for Russian and German, as well as British, steamers trade to the Shat-el-Arab ports, and water-transport is cheaper than that by railway.

M. Svegintseff stated to Reuter's Agent in November last that the Trans-Persian Railway was to be international, and was not to be divided into sections controlled by different groups. That rule will surely apply to the branches as well as to the main line. To refuse to Turkey the line from Trebizond to Tabriz is to take the bread out of the mouth of Trebizond, and to put it into that of Batum. Both these ports should naturally be feeders of the Trans-Persian Railway, and the same measure should be meted out to both. When addressing the Conference of Railway Merchants at Moscow on the 23rd November, M. Klemm stated that he felt sure that financiers in London and Paris would not support the scheme, unless it could be made a commercial success. The knowledge that the trade of Trebizond is to be lost to the railway can hardly fail to influence unfavourably the financier of London and Paris and even of Berlin. My own feeling in regard to this point is that the "internationality" of this railway—a railway of which the Persian section should ultimately become a Persian State Line—should be rigidly safe-

guarded on international principles, and not sacrificed here and there to the special interests of any one Power. If it is, surely intrigue, injustice, and trouble will result. I am well aware that years must elapse before the Persian State section of the railway can be entirely entrusted to Persian management; but till that time comes, international management should be fairly and strictly maintained.

It is generally accepted that the country from Teheran to Kerman is not a difficult one from the point of view of the railway engineer. At Kerman we enter the British sphere. The reports which have come from St. Petersburg and Moscow, and the communications made by M. Svegintseff and M. Timiriazeff during their visits to London, show that the Russian promoters of this railway expect to join the existing Indian railway system at Nushki. From such knowledge as I possess, I infer that there are serious objections to this plan. Between Kerman and Kuh-i-malik-siah lies the desert called Dasht-i-Lut, which no railway, I believe, can cross. To the west of Kharan, again, is another impracticable desert. Thus, a line from Nushki, following the caravan route to Robat, situated at the base of Kuh-i-malik-siah, would have to make a very wide detour, either to the north or to the south, in order to reach Kerman. Lastly, the steep gradients, which lead up from Nushki to Quetta and down from Quetta to Sibi, are to be avoided. Traffic over such gradients is very expensive, and it seems absurd to make a great through railway wind up and down among mountains for a hundred miles or more, if a straighter or more level alignment can be found. In 1891, General Sir James Browne showed me a plan, on which, if I remember rightly, the proposed route for a railway from Karachi via Las Bela, Panjgur and Bāmpur to Seistan was laid down. Such a line between Sonmiani and Karachi is commanded from the sea: and that, having regard to our naval power as a safeguard to India, is a point not to be overlooked.

In *The Gates of India*, Sir Thomas Holdich has indicated the line which he considers would be the easiest and best. It runs from Kerman via Bāmpur to Panjgur, from which latter point, he states, the alignment must depend on the objective. Now, the Russian promoters of the railway name, as the starting-point of its service, Calais, and as its destination, Calcutta. That being so, the main line from Panjgur would pass through Quetta, Hindu Bagh, and the Gomal Pass to Lahore, avoiding the descent and détour by Sibi and Sukkur. Such a route, at least, seems possible. From Panjgur, again, a branch would almost certainly be made to Karachi, the easiest channel for all traffic to and from Central, Western, and Southern India. Thus Nushki would be left *en l'air*, and as far as I can judge, its communications with Seistan and Khorasan would continue to be by caravan. It has long been the ambition of Russia to connect its Central Asian possessions by railway with the Persian Gulf, and I gather that a branch from Kerman to Chahbar, or Pasni, on the shores of the Gulf, is part of the Trans-Persian railway scheme. Such a branch, be it noted—and this is important—would traverse and terminate at a port in either the British sphere of Persia or in British Baluchistan. If Kerman is connected by railway with

Mashhad and Dushakh on the Trans-Caspian Railway, Russia's ambition will be attained, and that by a line traversing, from Birjand southward, territory either British or under British protection.

I noticed that the *Pioneer*, in discussing this railway scheme, is led on to consider the possibility of through communication from Europe through India to China. As is generally known, the great obstacle to connecting India by rail with China lies in the difficulty of crossing the great parallel ranges which separate Burma from Yunan. Major Davies, of the Oxfordshire Light Infantry, spent one or two years, under the orders, I believe, of the Government of India, in surveying this country. In recognition of his work, he received the Gold Medal of the Royal Geographical Society, but, so far, his surveys have not been put to any practical use. I think it is clear, however, that if any through railway from Central Europe to the Far East is to be made within the next decade, it will be achieved through the Indian railway system. Eastern Bengal has advantages so distinct over Western Turkestan, as an avenue to China, that I do not think that I need say more now. It is well to realise that the ultimate issue of the Trans-Persian railway may make Northern India the half-way house of a vast railway system directly connecting Central Europe with Central China.

I think it must be accepted that the primary aim of the original promoters of this railway is political, but I believe that it is capable of being made commercially successful. I admit that the competition of other routes, land and sea, converging on the East is a serious thing to face—competition by the Suez and Panama Canals, by the Cape route, and by the great Trans-Continental railways of the Eastern and Western Hemispheres; but I venture to feel confident that a railway which taps the wealth and traffic of the vast populations of Europe and of India, and of the lands where flourished the "Great Oriental Monarchies" of pre-Christian days, and across which Alexander marched his victorious forces, will be a commercial success. The industries of India are growing very rapidly, and will find an outlet by rail as well as by sea. All tradition, all history, tells of the almost fabulous profits of the trade between East and West, and equally of the prosperity which existed in Khorasan and Seistan until Turk and Tartar hordes had overrun and laid waste countries once fertile and populous. Sir Colin Scott-Moncrieff went to Merv in 1890 to show the Russians how to revive the greatness of a city which once bore the proud title of "Queen of the World," and Sir William Willcocks is restoring the Garden of Eden. Seistan and Mekran still await their deliverer. The Trans-Persian Railway may play that rôle.

When it comes to considering this railway from the financial point of view, I can but quote the opinions of others. The Russian syndicate has estimated the cost at twenty-one million sterling. A writer in the *Pioneer*, forming his judgment independently, named twenty million as the probable cost. Experience shows that when Russia has strong political reasons for wishing to make a railway, the capital will be forthcoming; and as proofs of this I quote the Trans-Caspian and Trans-Siberian and suchlike railways. When Russia, being of this mind, is

supported by British feeling and British capital, the problem is even more easily solved.

One point we have not yet considered, and it is a most essential one, viz., the probable attitude of the Persian government, and of the Persian people, towards this scheme. Forty years ago, the construction of the European telegraph line had to contend with a good deal of covert bigotry and ill-will, and we cannot be certain that the same spirit may not be encountered again: still, we can surely rely on British and Russian diplomacy to convince the Persian government that the mere construction of the line means bringing millions of money into the country, and that the railway which becomes one of the great links between Europe and India, and, eventually, the Far East, cannot fail to restore Persia to a degree of prosperity, which she has not known for at least two centuries. As I was preparing this paper, I chanced to come across a little volume of *Miscellaneous Poems* by Sir John Malcolm, famous a century ago as our Ambassador to the court of the Shah of Persia. The following passage struck me as being appropriate to the state of Persia at the present hour:—

"Yet through the mist of ages past we trace
The dazzling glories of a wondrous race.
Ferdosi's song and sculptured rocks still tell
How Rustum conquered and how Sohrab fell,
How great Jemsheed all other kings outshone,
Who tried on earth to raise a heavenly throne;
And still, Persepolis, thy ruins grand
Shed a proud lustre o'er a fallen land,
Like the dark shade of Persia's ancient power,
On her degenerate sons thou seem'st to lour."

In the carrying out of this scheme, Persia may be no more than the instrument of the ambitions of greater Powers: but none the less the prospect is full of promise for her, and now, if ever, she has the opportunity of reviving the past glories of Naushirwan and Shah Abbas. British interests, political and commercial, are best served by a strong Persia: and if this railway strengthens Persia, it strengthens Britain.

BRITISH WORK IN SPITSBERGEN: SOME HISTORICAL NOTES.

By R. N. Rudmose Brown, D.Sc.

At a time when greater interest is being evinced in Spitsbergen—and not only from a scientific point of view—a few notes on British exploration and British interests in Spitsbergen may not be out of place. The history of intercourse with Spitsbergen, broadly speaking, can be divided into three periods of unequal length. Soon after the discovery of Spitsbergen in 1596 opened the era of right-whaling in the bays of

the archipelago and its adjacent waters. Throughout the seventeenth century, particularly in its first five or six decades, the whale fishery flourished. During the eighteenth century it steadily languished in the bays, and was latterly prosecuted chiefly in the adjacent seas, where it has persisted ever since with some noticeable revival in recent years. But this does not concern the question of the exploitation of Spitsbergen. Towards the middle of the eighteenth century began the second period of importance in Spitsbergen history. This was the era of the trappers and hunters who came in search of the skins of bears, foxes, and reindeer. This occupation has persisted until the present day, but is now less remunerative owing to the diminution in numbers of fur animals and the virtual extermination of the walrus. In the closing decades of the eighteenth century opened the era of scientific exploration of Spitsbergen, and following upon the discoveries made by various expeditions began, about the end of the nineteenth century, the exploitation of Spitsbergen mineral resources and the establishment of settlements of some degree of permanency.

The history of Spitsbergen until the opening years of the nineteenth century has formed the subject of research by Sir W. Martin Conway. From his published work—and more especially his invaluable *No Man's Land*—the following summary of British interests during the seventeenth and eighteenth centuries is in the main extracted.

Bear Island and Spitsbergen (including the mainland and Prince Charles Foreland) were discovered by the Dutch in 1596, but the discovery was not followed up by men of that nation. In 1604 Bear Island was visited by one of the ships of the Muscovy Company of London, which brought back a cargo of walrus ivory. In succeeding years it was visited by other English ships, and valuable cargoes of tusks and oil were brought home. In 1609, Poole, an Englishman, discovered good coal there. Until 1607 Spitsbergen does not appear to have been revisited, but in that year Hudson visited its shores in the *Hopewell*, and reported numbers of whales in Whales Bay. In 1610 one of the Muscovy Company's captains (Captain Poole of the *Amitie*) discovered and named on the west coast of Spitsbergen several bays and anchorages, including many parts of Prince Charles Foreland. He reported an abundance of whales, and captured 120 walrus, 21 reindeer, and 30 bears.

These two reports of whales, both due to English navigators, first started the Arctic whale fishery, which began in 1611 with two English ships sent by the Muscovy Company. In 1612 two of the Muscovy Company's ships were again on the scene, as well as two other English ships, and a Dutch and a Spanish ship, each in charge of a former employé of the Muscovy Company. One of these English ships carried the exploration of the coast of Spitsbergen further north than Hudson. In 1613 the Muscovy Company obtained a charter from King James VI. excluding from the whale fishery all ships, whether British or foreign, which did not belong to the Company. This year there were eight English ships, and several Dutch, and a few from Biscayan ports. But the English ships, one of which was for the protection

of the others, and two, it should be noted, for exploration, so successfully molested their rivals that few of the foreigners had any success. The English headquarters were Sir Thomas Smith Bay, which was the north end of Foreland Sound, with adjacent bays. In 1614 the Muscovy Company, obtaining an order in Council to uphold the King's right to Spitsbergen, sent a fleet of thirteen ships, of which two were for exploring purposes and two to take possession of lands. A considerable amount of exploration was done, and possession was taken of "King James His New Land" at several points, including Magdalena Bay, Hakluyt's Headland, Redcliff Sound (Red Bay), etc. Since at least 1612 Prince Charles Foreland had been known by its present name, though exactly who it was that named it after King James's son is uncertain. A *modus vivendi* regarding the use of harbours was this year reached with the Dutch, who had a fleet of fourteen whalers, with a convoy of three or four men-o'-war, in Spitsbergen waters. For some years this arrangement, originally but a temporary one, failed to satisfy both parties, but from 1619 onwards the Dutch stuck to the north-west corner and the north coast, while the English had all the other west coast bays. The Dutch also had a fishing about Edge Island, and several English ships went annually to the east of Spitsbergen.

In the belief that Spitsbergen was part of Greenland (as it was always called in these days) the King of Denmark in 1615 sent three Danish men-o'-war to assert his sovereignty. But the annexation by Britain practically put an end to claims on the part of Denmark in that year, though the Muscovy Company was wrong in insisting that it was British by right of discovery. Neither was the Danish whaling activity in Spitsbergen extensive, although it showed some persistency, and a few Danish vessels were found from year to year with the Dutch or later the English. In 1617 and 1618 there was much quarrelling between the English and Dutch ships, chiefly in Horn Sound and in Sir Thomas Smith Bay. The Dutch were on the whole successful, but the dispute was carried home for settlement, with a result that in March 1619 King James VI., while adhering to his sovereignty over Spitsbergen, promised not to enforce it for three years, during which English and Dutch were both to have access to the whale fishery. The Dutch proposition for the partition of Spitsbergen was dropped. The British claim as made by King James, if not reasserted since that date, was never revoked. The Danish claim to sovereignty was brought up at various times, but received little attention. In 1623 Denmark protested against the exclusion from Fairhaven of two Biscayan ships sailing as Danish, but apparently with little result. About 1625 the Danes seem to have been ousted from Mauritius Bay and Smeerenburg, and to have claimed and held Robbe Bay. In 1638 Danish men-o'-war again appeared in Spitsbergen, and for several years Danish claims were put forward intermittently until the bay whale fishing was abandoned in favour of open-sea fishing. Then they were dropped. In 1624 Fairhaven and Magdalena Bay were forsaken by the English whalers for the sake of King's Bay and the bays to the south. Cove Comfortless, Ice Fjord, Bell Sound, and Horn Sound were all important stations. On Axel Island in Lowe

Sound was the station of the Hull whalers for more than twenty-five years from 1626. The dissension between the Dutch and English quieted down, and for a few years the strife in Spitsbergen waters was principally between Dutch and Danish, and Dutch and French. In 1630-31 a party of eight men from a London whaler were compelled to winter in Bell Sound, having missed their ship in a fog. These Englishmen are the first recorded winterers in Spitsbergen. The importance of the English whale fishing can be judged from the fact that the Muscovy Company's fleet at this time used to bring home annually 1100 tons of oil. The annual tonnage employed was 2500, and the number of men 1000, and the cost of a year's voyages, £12,000.

In 1642, for the first time, Hamburg ships took part in the whale fishery, and in 1644 the number of French ships considerably increased. Soon after the bay fishing declined, and the Dutch whalers in increased numbers took to the open sea. Spitsbergen harbours were little used by them after about 1650 except to assemble in before returning home.

Whaling in the English bays persisted some time after this. In 1654 two men-o'-war were sent to protect the English whalers against the Dutch. While the Dutch sea fishing prospered the English bay fishing rapidly declined. In 1656 there were only six English ships, in 1657 only five, in 1668 none, and in 1669 but one. So that by about 1655 the English bay whale fishing may be said to have been at an end. For about a century the open-sea whale fishing—the only form possible—remained in foreign hands. The end of the eighteenth century marked the close of this fishery for the Dutch, and during the nineteenth century it passed chiefly to English and Scottish ships, with a few, less successful, Norwegians. But this has little relation to Spitsbergen, as the whalers seldom touch there. In recent years, however, Norwegian steam whalers have been hunting finner-whales off the coasts and towing them in to their station in Green Harbour. The industry is, however, a very small one.

The British interests in Spitsbergen in the whaling period of its history were thus of paramount importance: but of no less significance as regards Britain's interest in the archipelago is that a great part of the discovery of the coasts and islands was the result of English work. Fotherby, Marmaduke, and Edge, all English whaling skippers, are among the greatest of Spitsbergen explorers. Fotherby is responsible for many of the names on the northern coasts, and Poole for many on the west. Hope Island was discovered by Marmaduke, and possibly he also discovered Edge Island, before the Dutch found it or Edge rediscovered it. The English discovered Wiche's Land, and at the same time sighted Sir Thomas Smith's Island, now named North-East Land. In fact, all round the islands of Spitsbergen—to use the name for the whole archipelago—British names are prominent, and remind one of British exploration.

During the first half of the eighteenth century Russian trappers began to frequent Spitsbergen in search of fur-bearing animals, and they appear to have had a monopoly in this matter until the advent of Norwegian rivals in 1795. Norwegian rivalry gradually drove out the

Russians, and the last trappers of that nationality to winter in Spitsbergen seem to have spent the winter of 1851-2 in Red Bay. There is no record of British trappers having wintered or hunted in Spitsbergen. Norwegian trappers still winter in Spitsbergen, if not in decreasing numbers certainly with much diminishing profits, owing to their own ruthless extermination of the game. While trapping and hunting were the means formerly employed to secure skins, in recent years the Norwegian hunters—almost the only ones who now frequent the archipelago—have resorted to the use of poisoned meat as a method of killing bears and foxes. Many animals which eat this meat and subsequently succumb are never found by the hunter, since they creep away to die in hidden corners and holes. Two years ago in Spitsbergen the writer found the remains of at least half-a-dozen white foxes which must have met such an end. Hence, quite apart from the dastardly nature of such tactics, the hunters defeat their own ends by the employment of poison. Moreover, many gulls die of the poison, and one can imagine whole water-courses becoming contaminated and dealing death to every living thing along their banks. The destruction of reindeer, foxes, and birds is bad enough, but sooner or later human life will be lost as a result of this use of poison. The Norwegian Government have put severe restrictions on the sale of strychnine, but the hunters manage to procure it nevertheless. These vicious methods can only be stopped by some strong government having jurisdiction in Spitsbergen.

The era of scientific exploration in Spitsbergen opens with a British expedition. H.M. ships *Racehorse* and *Carcass*, under the command of the Hon. John Phipps (afterwards Lord Mulgrave), sailed north in 1773 hoping to obtain a high latitude to the north of Spitsbergen. While they only succeeded in reaching 80° 37′ N., they did some exploration about Fairhaven, Low Island, and the Seven Islands, and took observations and made collections. This expedition must always be noteworthy in another way, for among the midshipmen of the *Carcass* was the future Lord Nelson, then a boy of fourteen. In 1807 some of the northern coasts were charted by Captain Brook. The next explorer of Spitsbergen was an Englishman, William Scoresby, Jr., the son of a famous Arctic voyager and explorer. His lucid, accurate, and scientific descriptions of what he saw of north-west Spitsbergen make his writings of especial value. From his day exploration may be said to have taken definitely a more scientific turn. In 1818 a British Government expedition in the *Dorothea* and the *Trent*, under Captains Buchan and Beechey, sailed with orders to penetrate as far north as possible in Spitsbergen seas. On their way north they made an accurate survey of Fairhaven and the vicinity—the first accurate map ever made of any part of Spitsbergen. In 1823 Spitsbergen was selected as a suitable spot for pendulum observations, and for this purpose was visited by H.M.S. *Gripper* with Sir Edward Sabine on board. It was on subsequent suggestions and recommendations of Sabine that later Swedish and Russian expeditions went to Spitsbergen to measure an arc of meridian. In 1827 Sir Edward Parry, in H.M.S. *Hecla*, utilised Hecla Cave in Treurenberg Bay as a base for an attempt to reach the Pole. In their subsequent journey to

82° 40′ N. and the return they explored parts of the coasts and islands from the Seven Islands to Treurenberg Bay. They also mapped that bay and surveyed Hinlopen Strait to Foster's Islands. Many geological and other observations were also made.

In 1856 the Marquis of Dufferin and Ava (then Lord Dufferin) visited Cave Comfortless (English Bay) in the schooner-yacht *Foam*. It may be of passing interest to note that the stone on which the record of this visit was inscribed was found in 1909 by the compiler of these notes exactly where Lord Dufferin had placed it, and with its legibility unimpaired. Several expeditions to Spitsbergen waters were made by the Scotsman James Lamont; in 1858 and 1859 in the *Generra* and in 1869 and 1871 in the *Diana*. He confined his attention chiefly to Wybe Jansz Water (Stor Fjord) and Olga Strait, and though principally concerned with hunting, his records contain much new and valuable geographical information. In 1871 Mr. B. Leigh Smith, the rescuer of the Swedish expedition of 1872-3 from starvation and death, made the first of a series of important expeditions to Spitsbergen. In the schooner-yacht *Sampson* he explored Hinlopen Strait and the northern coast of North-East Land. The eastern cape of this land is now named after him. In 1872 Mr. Leigh Smith with the same yacht explored on the north coast; and in 1873 in the steam-yacht *Diana*, with the *Sampson* as a tender, he again visited the north and made considerable additions to our knowledge of the animal life as well as the physical conditions of the sea. In 1880 Mr. Leigh Smith once more visited Spitsbergen, ascending Wybe Jansz Water on his return journey from Franz Josef Land, where he did such splendid exploration.

During the last half century several British naturalists have visited Spitsbergen, notably the late Professor A. Newton in the yacht *Sultana* in 1864, and Colonel H. W. Feilden in the yacht *Saide* in 1894, and several sportsmen and tourists, as the Marquis of Ormonde in the yacht *Mirage* in 1874, Sir Henry Gore Booth in the *Lancashire Witch* in 1888 when he reached North Cape, and the Duke of Hamilton in the *Thistle* in 1892, while in 1895 the British training squadron of H.M. ships *Active*, *Volage*, *Ruby*, and *Calypso* visited Bell Sound and Schoonhoven and did some survey work. Among other British enterprises in Spitsbergen in these years must not be forgotten Mr. Arnold Pike's wintering on Danes Island in 1888-89, or an important visit in the *Victoria* in 1897 to the little known Wiche's Land, and his cruises in the same year through Olga Strait, Wybe Jansz Water, Heley Sound, Hinlopen Strait, and along the northern coast of North-East Land. In 1896 the Jeaffreson-Farnham expedition visited Spitsbergen and commenced exploration from Cape Thordsen. The country at the head of Dickson and Klaas Billen Bays was explored, and a crossing of Spitsbergen was made from Dickson Bay to Wijde Bay (more correctly, Sir Thomas Smith Inlet). Explorations of the interior from Bell Sound were also carried on.

One of the most important and fruitful expeditions in the history of the archipelago was that of Sir W. Martin Conway in 1896. Conway was accompanied by Dr. J. W. Gregory, Mr. E. J. Garwood, and Mr. A. Trevor-Battye. They spent two months in Spitsbergen making numerous

journeys into the interior by Advent Dale and Sassendal, and were the first men to cross the mainland of Spitsbergen. Indeed, before this expedition the interior was quite unknown and was vaguely marked on maps as a region of inland ice. Spitsbergen was crossed by the Sassendal, Fulmer Valley, and the Ivory Gate to Agardh's Bay on Wybe Jansz Water. A map was made of the districts traversed, as well as of Dickson and Wijde Bays. Altogether 600 square miles were surveyed, and Mount Hedgehog (Horn Sunds Tind), supposed to be the highest mountain in Spitsbergen, was ascended. Researches of the greatest importance were carried out in geology and glaciology. On the s.s. *Expres* the expedition subsequently visited the west and north coasts of Spitsbergen, passing through Foreland Sound and lastly penetrated Hinlopen Strait, and were only prevented by ice from reaching Wiche's Land.

In 1897 Sir Martin Conway and Mr. Garwood returned to Spitsbergen and explored and surveyed the interior both north-eastward from Klaas Billen Bay, and south-westward from Deere Sound (King's Bay), thus proving that no "large part of Spitsbergen, except New Friesland and North-East Land, is covered by an ice-sheet." Some survey work was also done about Horn Sound.

The region to the immediate north-west of Horn Sound was explored in 1897 by Mr. Victor Gatty.

In 1898 Major Andrew Coats, with Dr. W. S. Bruce on board as naturalist, after making explorations in Novaya Zemlya and Kolguev, visited Hope Island and steamed within a few miles of Wiche's Land, in his yacht *Blencathra*, when he was stopped by impenetrable pack. He afterwards visited Wybe Jansz Water, and was almost wrecked on an unknown reef at the entrance to that fjord, which was thus duly charted. The *Blencathra* carried out a valuable bathymetrical survey in these waters, and made many trawlings, tow-nettings, and physical observations.

In 1898 and 1899 H.S.H. the Prince of Monaco was in Spitsbergen waters with his yacht *Princesse Alice*. On both occasions he was accompanied by Dr. W. S. Bruce, and in 1898 by Mr. J. Y. Buchanan of the *Challenger*, and in 1899 by Mr. W. Smith, Junr. Dr. Bruce on both occasions did much zoological and oceanographical work, and took part in the detailed survey of Red Bay.

During the whole of the summers of 1906 and 1907, Dr. W. S. Bruce was engaged in the exploration and survey of Prince Charles Foreland, a previously neglected part of Spitsbergen, while in 1909 the Scottish Arctic Expedition, in the steam-yacht *Conqueror*, under Dr. W. S. Bruce, sailed to complete this work. The expedition had a staff of surveyors, geologists and naturalists on board, including Mr. J. Mathieson, Mr. J. V. Burn Murdoch, Mr. H. Hannay, Mr. E. Miller, the late Mr. A. Peach, Dr. R. N. Rudmose Brown, and others, who accomplished a considerable amount of work, finally completing the exploration and survey of the Foreland and Foul Sound. The map thus made is the most detailed ever made of a large area in polar regions. Among other exploration accomplished by the expedition was the crossing of the mainland from the Sassendal to Wiche Bay by Dr. Bruce and Mr. H. Hannay.

As a result of these expeditions it may be pointed out that Dr. W. S.

Bruce has probably more extensive knowledge of Spitsbergen than any other explorer. Not only has he completed the detailed survey of Prince Charles Foreland, but he has visited and carried on survey work to the north of Hinlopen Strait, in Treurenberg, Liefde (Wiche), Smeerenberg, Magdalena, Cross (Close Cove), King's (Deere Sound), English (Cove Comfortless), and St. John's (Osborne Inlet) Bays, and in practically every bay in Ice Fjord, having visited some of them many times; he has also visited all the bays of Bell Sound and Wiche Bay, Ginevra Bay and Heley Sound in Wybe Jansz Water. In almost all these parts Dr. Bruce has made a large series of soundings, and many biological collections as well as physical observations. He has extended his surveys inland, ascending several mountains over 3000 feet, as well as others of less altitude. His land journeys in the neighbourhood of Wiche Bay, Barents Island, and in the vicinity of White Mountains were most important, as well as his landing on Hope Island, and his two landings on Bear Island.

Nor must the work of Scottish whalers in Spitsbergen seas to the west, and their visits to Spitsbergen fjords, be forgotten, especially the meteorological observations of Mr. R. C. Mossman in the *Scotia* (Captain T. Robertson) during the summers of 1906 and 1907.

These few notes bring out several points that are too often overlooked. Firstly, that early English whalers are responsible for the discovery of Spitsbergen and its charting; secondly, that in 1614 Britain made a claim to Spitsbergen from which apparently she never withdrew; and thirdly, that Britain began the exploitation of the animal resources of Spitsbergen waters, and while this lasted more than held her own among rivals, in fact in the whale fishery she led; lastly, it is worth remembering that it was eight Englishmen who first spent a winter in Spitsbergen. At a later day it was Britain who inaugurated the scientific exploration of Spitsbergen, which has been continued by British explorers, from the expedition of Phipps in the *Racehorse* and the *Carcass* in 1773 to Bruce's Scottish Arctic Expedition in the *Conqueror* in 1909, and Sir Ernest Shackleton's projected expedition this year.

In the tourist traffic to Spitsbergen, Britain has always taken a leading part, since the Orient liner s.s. *Lusitania* visited Ice Fjord in 1894 to the present day, when every summer the P. and O. s.s. *Vectis* and other tourist boats visit Advent Bay or Bell Sound.

In commercial interests Britain's stake is considerable. The first successful coal mining was in the hands of a British company, and since then two other British companies with large mining interests have laid claim to extensive tracts of territory in Spitsbergen. Apart from the Arctic Coal Company of Boston, U.S.A., no nation has such extensive commercial interests in Spitsbergen as Britain.

GEOGRAPHICAL DESCRIPTION OF THE COUNTY OF SUTHERLAND.

By Alice B. Lennie, M.A., B.Sc.

(*With Illustrations.*)

(*Continued from page* 142.)

Sea Fisheries.

Sir Robert Gordon, in the middle of the seventeenth century, comments on the great abundance of fish off the shores of Sutherland, and deplores the small use made of them. This neglect was however confined to the people of the county, for we learn from other sources that at that time boats from the Firth of Forth regularly resorted to the west coast of Sutherland and Ross for the herring fishing in autumn and early winter. Yet the people had plenty of fish for their own wants, for those on the coast fished from small boats close in shore, while inland every burn and loch teemed with fish. A hundred years ago the valuable lobster fisheries, which have always been most productive, were in the hands of London merchants, who employed local fishermen to catch the lobsters, and conveyed them to the south in welled smacks. At the time of the Sutherland clearances, when the people were removed from their inland homes to the coasts, it was with the avowed intention of promoting the fishing industry. In the north there were few facilities in the way of harbours, but on the contrary a dangerous rocky coast with strong currents and violent storms, so it is little wonder that such compulsory methods were not successful. A succeeding generation, with increased facilities of harbourage, better boats, and improved communication (by steam vessels) with the southern markets was more successful. Large quantities of herring and other fish, including shell-fish, were caught; and several piers and harbours were constructed, but within the last ten years there has been a serious falling off. So great was the distress in 1904 that a commission was appointed to inquire into the causes, and report on possible methods of restoring prosperity. It was found that the east coast was the worst off. The long-line fishing in the Moray Firth had been apparently destroyed by the trawlers, who were also blamed for the desertion of the herring; while the lobster fishing on that coast was not by itself a sufficient means of livelihood. On the north and west coasts, on the other hand, it was the chief industry. The great difficulty there was the distance to the market from these outlying districts, thirty to sixty-five miles from the railway at Lairg. For this distance the cost of carriage by cart or mail-coach was 4s. to 11s. per hundredweight, thence to London only 4s. 6d. In addition, the delay in transit caused serious losses, and totally prevented advantage being taken of the abundance of crabs. It was suggested that motor coaches might be established to afford rapid and moderate transport,

and this suggestion has been carried out, but with disappointing results. A little white fish is still caught, but almost entirely for local use. The herring fishing industry is gradually being concentrated at Wick. Larger boats are required to follow the herring out to sea, and the harbours and slips of Sutherland cannot accommodate such. On the north the fishing boats have to be drawn up on the beach, and the harbours of the east are very inadequate. Large sums have been spent on the harbour of Helmsdale since the foundation of the village in 1818. A new harbour was constructed in 1890, but it is already out of date, and in view of the decline of the Moray Firth fishings, the Commissioners could not recommend any further expenditure ; it is consequently rapidly declining as a fishing station.

Industries.

The various enterprises which flourished for a time, and then declined, would of themselves form an interesting study. As far back as the neolithic age we find indications of trade and industry, for three sites where flint implements were manufactured are known in Sutherland, and at the Little Ferry alone there has been found over three hundred perfect arrow heads, besides many saws, knives, etc., and broken pieces. Some are made from a very fine local chert, others from flint which must have been brought from a distance.

Salt pans were erected at Brora early in the seventeenth century, and at the beginning of last century were again established, when large quantities of salt were distributed to all the northern counties, as much as ten thousand bushels being shipped in a single year ; but after the abolition of the salt tax the manufacture ceased. Flax spinning, kelp manufacture, fish curing, distilling, and such home industries as weaving, brewing, tanning, etc., have all been carried on extensively. An interesting experiment in cotton manufacture was made at the close of the eighteenth century. At that time the rising prosperity of the Lancashire villages was attracting attention, and great hopes were entertained of a similar development in Sutherland. A factory was erected at Spinningdale, between Dornoch and Bonar Bridge. It contained thirty-six jennies, of one hundred and thirty-six spindles each, and employed about one hundred hands. Houses for the workers were also built, and were almost the first stone cottages in the county. The project seemed on a fair way to success, but the factory was burnt down in 1806 and was never rebuilt. A later experiment was a carpet factory at Helmsdale, which employed girls from the large fisher population in the immediate neighbourhood.

The present industries are almost entirely confined to Brora, largely owing to the presence of coal. As the outcrop of the seams is exposed on the beach, coal has been known and worked here from very early times : but mining has been carried on only intermittently in connection with the salt pans. In 1872 the mine was reopened by the late Duke of Sutherland, and has been worked continuously since, giving employment to about thirty miners. The present shaft is situated close to the river, about half-a-mile above the bridge, but the actual workings extend seawards almost under the village.

Immediately adjacent to the mine is a brick and tile factory, clay for which is dug from the steep bank which hems in the narrow river terrace on which it stands. About thirty-five men are employed in making bricks and field drain pipes, which, though rough, are very durable, and are sent all over the north. A unique feature for the Highlands of Scotland is the row of neat brick houses which face Brora railway station. To facilitate transport, a line of narrow rails for horse traction extends from the brick works to the railway station, passing the coal pit, and two factories, and with a branch to the harbour. Of these two factories one is a small engineering works which has been established for some time, the other, of quite recent date, is the Sutherland Wool Mill, which employs forty hands, and is fitted up with all the latest machinery for treating the wool, including scouring, dyeing, carding, spinning, weaving, etc. Only the best wool is used, coming largely from Sutherland and Shetland. The latter is used specially for worsted, and to mix with the other for tweeds. The trade is entirely retail, but there is a steady demand for all the output. The crofters often send their wool to be dyed and carded at the mills, and sometimes to be manufactured into cloth or worsted.

Another smaller mill which was established early last century is still carried on at Pittentrail, near Rogart. Hand-loom weaving has been greatly encouraged by the Duchess of Sutherland, but is carried on only by the older men, and is apparently dying out. At present there is only one weaver at Brora, and a few at Rogart and in the west.

A very successful distillery exists to the north of Brora village at Clyneleish. It was built in 1819, and is now the only establishment of the kind in Sutherland.

History.

As might be expected from its isolated position and meagre resources, the historic period in Sutherland is very late. Ptolemy's map, no doubt, gives the names of four tribes who then inhabited the county, but these are mere names. All that we can say of the early inhabitants is that they belonged to the Brythonic branch of the Celtic race.

In the sixth and seventh centuries the Columban missionaries reached these northern lands, but in their case also records are wanting. Saint Maolrubha also made an extensive tour through the county in the eighth century, and was slain by the Norsemen in Strath Naver, where his grave is still venerated to-day. The number and distribution of the early churches, chapels, etc., of which little trace remains save in place names and local tradition, indicate a considerable population, widely dispersed, the centres being much the same as at present.

A new chapter in the history opens with the advent of the Norsemen, who harried the coasts as early as the seventh century, but made no settlements till well on in the ninth. Then for a time Sutherland and Caithness became part of the Norse Earldom of Orkney, and later, in the middle of the eleventh century, formed together the Earldom of Caith-

ness. In Sutherland, however, the invaders occupied parts only of the coasts and straths, and never penetrated far into the interior. It is from this period that the name of the county dates. Sutherland was distinguished from Caithness as the "southland." The appropriateness of this title is more apparent when we remember that the territory so designated comprised only a small part of the present county,—namely, the east coast and the straths opening off it. As the typical Norse endings to place names on the coasts of Sutherland differ from those in Caithness [*e.g.* boll or -bo, a habitation, so common in Sutherland place names, is replaced by -ster in Caithness], Chalmers infers a corresponding difference in the settlers of the two regions, which may also help to account for the distinction in name between them.

With the rise in power of the Scottish Kings a third element was introduced. In the constant warfare that ensued between the Norse and the Dalriadic Scots, Sutherland lay right in the way of the contending armies. In the middle of the twelfth century further complications arose by the extension of the ecclesiastical system in Scotland and the erection of the Bishopric of Caithness, for even the extension of the church was not without bloodshed. The first Bishop mentioned was probably never north, but his successor, who was more adventurous, was barbarously mutilated though apparently not killed. To avenge this outrage William the Lion himself led an expedition to the north, and the Norse were finally defeated and driven out of Sutherland. To maintain peace, he left two of his followers in charge of the east and north districts. These men became founders of the houses of Sutherland and Mackay, and in this way feudalism was introduced, and replaced the old Celtic systems. But in spite of this lesson, a later Bishop was killed in Caithness in 1222, and again the Scottish king, Alexander II., led an army against the turbulent Norsemen. For his services on this and other occasions the son of Hugh Freskin, who had received the lands of "Sutherland," was created Earl of Sutherland in 1228. The new Bishop of Caithness was a kinsman of the earl, who gifted large lands to him. Bishop Gilbert was a man of great force of character and of great wealth and power, who reorganised his see and divided it into parishes. He selected Dornoch as the site for his cathedral. With the fate of his predecessors in memory, it is little wonder that he abandoned Scrabster and chose a site far removed and within the protection of his kinsman. The stone used for the building was a freestone easily carved, quarried in the immediate neighbourhood. The glass used is said also to have been made in the vicinity under the superintendence of the Bishop. Of the original structure there remains now only the massive central tower, the rest having been burnt down during one of the many raids in the centuries following. It is interesting to recall the fact that at this period the cathedrals of Elgin, Lincoln, and Salisbury were also being built. The parishes remain unchanged to-day in Caithness; but in Sutherland, Assynt has been added to the county, and the old parish of Durness was divided in the eighteenth century and the parishes of Eddrachillis and Tongue formed. Recently the civil parishes of Strathy and Reay have been changed.

The later history of the county is a melancholy chronicle of raids and reprisals between the different clans, which have no geographical interest.

Population.

Table VII.—Population from Census Returns.

Parish.	1801.	1811.	1821.	1831.	1841.	1851.	1861.	1871.	1881.	1891.	1901. No.	1901. Density per sq. mile.
Assynt,	2395	2470	2803	3161	3178	2989	3178	3006	2781	2551	2386	12·6
Clyne,	1643	1639	1874	1711	1765	1933	1886	1733	1812	1710	1724	14·8
Creich,	1974	1969	2354	2562	2582	2714	2511	2324	2223	2009	1836	10·7
Dornoch,	2361	2681	3100	3380	2714	2981	2864	2804	2525	2404	2794	51·0
Durness,	1208	1155	1004	1153	1109	1152	1109	1049	987	960	870	3·8
Eddrachillis,	1253	1148	1229	1965	1690	1576	1641	1530	1525	1409	1418	5·8
Farr,[3]	2574	2890	3051	3086	3284	3276	3192	3038	2924	2750	2557	6·3
Golspie,	1616	1391	1936	1149	1214	1529	1620	1894	1556	1451	1665	54·3
Kildonan,	1440	1574	565[1]	2571	256	2288[2]	2132	1916	1942	1823	1772	8·4
Lairg,	1299	1284	1094	1045	913	1162	941	875	1355	1169	1081	5·6
Loth,	1374	1330	2008	2214	2526	2470	610	583	584	528	449	16·6
Rogart,	2092	2148	1986	1805	1501	1535	1439	1341	1277	1195	1105	11·1
Tongue,	1348	1492	1736	2030	2041	2018	2077	2051	1926	1925	1783	14·0
Sutherland,	23,117	23,629	23,840	25,518	24,782	25,770	25,249	24,317	23,870	21,826	21,440	11

[1] Including Reay.

[2] Decrease due to clearances of the people.

[3] Kildonan extended to coast so as to include villages of Helmsdale, Port Gower, and Navidale, from Loth.

The character of the county is reflected in the distribution of the people. Sutherland is both the fifth largest county in area and the fifth smallest in population. The density of population, eleven per square mile, is half that of any other county. Inverness, Argyll, and Ross come next with twenty-one, twenty-four, and twenty-five respectively. Moreover Sutherland is the only county which has no town, according to the census returns, which limit the term to villages of over 2000 population. Golspie, the largest village, has just over a thousand inhabitants, while Dornoch, the county town, is even smaller. The actual distribution cannot be shown by figures, but the densities of the parishes bring out the main facts and indicate the more favourable conditions of the east coast as to climate, soil, and railway facilities. With its extremely small density of population, it is rather surprising to find that large parts of Sutherland are classed as "congested districts." The explanation lies in the fact that the people are crowded into a narrow area along the coasts, where the crofts are not merely small in size, but their deficiencies are increased by a poor soil. Recently the Congested Districts Board of Scotland have bought up a large tract in Strath Naver extending back to Loch Laoghal, which has been let off in twenty-nine small holdings. At present several of the houses and most of the outhouses are temporary erections of corrugated iron.

Owing to the sparse population the schools are small and have to be supplemented by side schools in the remoter parts of the interior. Of

the forty-six regular schools sixty per cent. have less than fifty names on the roll, and only ten have more than one hundred, including the Higher Grade schools of Dornoch, Golspie, Brora, Helmsdale, and Lairg. Another feature of the population is the high percentage of old people, largely due to the absence of young men and women, who have to go south to

Lairg.

find employment. As a result a proportionally large amount of old-age pension money is now finding its way to Sutherland.

In consequence of the absence of towns, there is a very small commercial element in the population. Agriculture and fishing are the chief occupations, but gamekeepers are a numerous class, and their numbers have been steadily increasing.

VILLAGES.

Village.	1841.	1851.	1861.	1871.	1881.	1891.	1901.
Bonar,	247	..	..	307	313	356	367
Brora,	123	..	482	474	532	540	548
Dornoch,	451	599	647	625	497	514	624
Embo,	..	..	..	374	396	471	546
Golspie,	491	..	876	1074	956	935	1024
Helmsdale,	526	..	762	794	675	743	779
Port Skerra and Melvich,	624	..	427	414	646	493	498
West Helmsdale,	..	..	492	717	659	580	480
Village Population,	..	..	3686	4779	4674	4632	4866

The only villages of any antiquity are Dornoch and Brora. The majority date from last century, some having been definitely planned at the time of the clearances, a fact which accounts for such names at Port

Gower and Bettyhill. Regular streets with shops are to be found only in Dornoch, Brora, Helmsdale, and Golspie, and the latter hardly deserves the plural as it consists of practically one long street extending for about a mile. The fishing village of Embo near Dornoch is built on a unique but singularly simple plan. It consists of five continuous rows of cottages all facing south and ending at the steep bank leading down to the beach. All the streets are exactly similar, on the one side the cottage doors opening directly on to the roadway, without garden or even footpath, while on the other side are the back gardens of the next row, with their outhouses, etc. The other villages, or rather townships, consist of crofts grouped irregularly about the high road, with a post office and perhaps a couple of shops. Melvich and Port Skerra is a typical example

Dornoch Cathedral.

and one of the largest, extending for over two miles. Bettyhill, Tongue, Durness, Kinbrace, Rogart, etc., are all of this type. Scourie and Lochinver, though small, are more regularly built. The latter is most beautifully situated on a deep bay, and is the chief holiday resort in the west.

Many other places marked on the maps are merely hotels, the posting stations of former times, and still halting places for the motor cars of today, but owing their present prosperity largely to the excellence of the angling in their neighbourhood. Such are Rhiconich, Altnaharra, Overskaig, Altnacealgach, Inveran, Oykell Bridge, and Inchnadamff. The last two, however, include also a small number of crofts. Forsinard consists of little more than a hotel and the stationmaster's house, but is of importance as the station for Strath Halladale. Laxford, the starting point of the Durness mail, consists solely of a stable.

Dornoch, a royal burgh and the capital of the county, is of great

antiquity. It first rose into importance as the ecclesiastical capital and cathedral city of the bishopric of Caithness, but in 1628 it received its charter from Charles I. The cross which was set up at that time may be seen in the accompanying illustration, which shows also the cathedral and, behind it, the tower, which is all that remains of the Bishop's Palace. It was restored when the present county buildings were erected on the site of the remainder. The prison was discontinued some thirty years ago, and the building is now used as a drill hall for the territorials. Dornoch also claims to be the last place in Scotland where a witch was burnt. A stone in the south-east of the village, dated 1722, marks the exact spot.

During last century the prosperity of Dornoch slowly declined, especially after the construction of the railway, which deflected much of the traffic that formerly passed through it. But the tide seems to have turned at last, and as a summer resort it is rapidly winning back some of its former importance. The light railway which now connects it with the main line has no doubt helped, but its chief attraction is the presence of the golf links, of which Sir Robert Gordon wrote nearly three centuries ago: "About this toun (along the sea coast), ther are the fairest and largest linkes of any pairt of Scotlond, fitt for archery, gofling, rydings, and all other exercise; they doe surpasse the fields of Montrose or St. Andrews." The flat sandy beach affords excellent bathing. There are at present three hotels, including the palatial one built by the Highland Railway Co. on a fine site overlooking the links. A number of large houses have been built recently in the same locality, but in the season all available accommodation is crowded.

Golspie has the advantage of being on the main line of railway and adjacent to Dunrobin Castle, the magnificent seat of the Duke of Sutherland. As before mentioned, it consists of one long street, but at the southern end, facing the pier, is a row of fishermen's cottages, and there are one or two short cross-roads. Immediately to the south is the Lawson Memorial Hospital, and farther on the Sutherland Technical School, founded in 1903, largely by the exertions of the Duchess of Sutherland, for boys from the northern counties. It is a residential school, and has accommodation for forty-eight boys, who receive free a three years' course of scientific and technical training, besides a sound English education.

Brora is a rising summer resort as well as an industrial centre. It contains three hotels. Like Dornoch, it has splendid golfing links, and here also large houses are being built overlooking the course. The principal street lies on the high south bank of the river, but the village straggles some distance along the north road. The fisher town is down by the harbour near the old salt pans.

Lairg has become one of the principal distributing centres in Sutherland, and stands at the point of convergence of five important routes (see sketch-map). The village is situated at the foot of Loch Shin, two miles from the station. The hotel is one of the largest and most important in the county, the centre of the motor service, and of the sporting and tourist traffic to north and west.

THE COLONISATION OF WESTERN CANADA.[1]

(*With Illustrations.*)

After exhibiting a number of slides showing settlers arriving in Canada, taking up land, etc., Mr. Dennis said that he desired to preface his remarks by expressing his keen appreciation of the honour done to him in Edinburgh in allowing him to speak under the auspices of the Royal Scottish Geographical Society. Probably no organisations in Great Britain had done more to encourage the extension of the British Empire than the geographical societies, and in this work, certainly, the Royal Scottish Geographical Society had taken its fair share. He was also encouraged in speaking about Canada as a whole, and particularly about Western Canada, in Scotland, on account of the great part that the Scottish people had played in the development of that country. They had had men like Sir Alexander Mackenzie, Donald Murray, Angus Macdonald, Simon Fraser, all men whose names indicated that they came from this part of the empire, and their efforts, although they were engaged in working or exploring for the Hudson Bay Company, did much to show what Western Canada was, to locate its main geographical features, and to establish Scottish ideas and Scottish thrift in that part of the western country. Canada, although its area exceeded very considerably the area of the United States, had a population of only 8,000,000 as compared with 100,000,000 in the United States, from which it was divided by what was practically an imaginary boundary. This vast country, greater in area than the United States, was just as great in natural possibilities, for in the Dominion of Canada they had all the potentialities for creating a great people. They claimed, in Canada, to have a country suitable for colonisation by the people from the northern portion of the globe, and they did not want the people from the southern portion. After drawing attention to the fact that the area of Canada is about as great as the whole of Europe, about twenty times that of the United Kingdom, and that the population is only one-sixth of that of the United Kingdom, Mr. Dennis said that the eastern provinces had been more or less developed and settled for a great many years, and with these he was not dealing. He wanted to speak of the colonisation of Western Canada, where there was a vast area suitable for cultivation. West of Lake Superior, out of a total population of 8,000,000 they had not more than 2,500,000 people.

Up to ten years ago the movement of people to Western Canada was very limited. The general idea was that its inhabitants lived up near the Arctic regions, and that they could not produce things that would make life even bearable, much less pleasant. They were now endeavouring to show the people in Great Britain and the European continent what Canada was. Realising that their first hope for the development of that country lay south of the international boundary, and that, unless they could prove to the people of the United States that the western region of

[1] Notes of a lecture by Mr. J. S. Dennis, delivered before the Royal Scottish Geographical Society in Edinburgh, on 11th January 1911.

Canada was a desirable country, their chance of proving it to the people of Great Britain was very small, their whole campaign at that time was based on trying to get the people of the western portion of the United States to see what they had, to get them to take up homes, and so to provide a foundation of facts with which to come to the people of this country. At that time the United States had still a large area available for settlement, but when that land became exhausted, the inhabitants began to come over the boundary into Canada. As a consequence, beginning ten years ago with 10,000 or 12,000 people, they brought into Western

A Farmhouse and Garden in Western Canada.

Canada from the United States 153,000 people in 1910, and during the present year they hoped to bring in 200,000. These people were of all nationalities, Scandinavians, Dutchmen, Frenchmen, Belgians, Russians, Servians, etc. After spending some time in Western Canada, these men became very loyal and patriotic Canadians, and wrote to their friends, disabusing their minds of a great many absurd ideas which existed with regard to Canada, but an important point was that they had not the slightest interest in the British Empire. In Canada they were being made into good Canadians, and it was for Britain to see that they were made proud of the Empire.

The company he had the honour to work for, the Canadian Pacific Railway, was largely concerned in the colonisation of Western Canada.

When that road was built it was thought to be a wild dream, and had it not been for Scottish determination and Scottish foresight, the Canadian Pacific Railway would never have been built, and he would point out that the idea of it was conceived by one of the greatest of Scotsmen, Sir John A. Macdonald, and the syndicate which undertook the building of it was composed of men like Mr. George Stephen, now Lord Mountstephen, Mr. Donald Smith, now Lord Strathcona, and Mr. R. B. Angus, now their senior director, Mr. Macintyre, and several others. At the present day, the Canadian Pacific Railway, next to the Dominion Government, was the largest landowner in Western Canada, and he wanted to emphasise the fact that at the present moment it was not

A Field of Grain.

necessary for any representative of the Canadian Pacific Railway to come to Great Britain or any other portion of Europe to obtain colonists for their land. Every colonist they wanted could be obtained from the United States. Two years ago he said to their president that they were not getting from the British Empire the class of people they ought to get, and that they could not expect the people of the British Empire to come over to Western Canada and undertake to develop their homes under pioneering conditions. They then adopted the policy of what they called "Ready Made Homes and Farms." They set aside certain areas comprising from 80 to 320 acres in extent, on each of which they built a house, a barn, fenced the farm, put down a well, and put 50 acres in crop. The land was then sold to the colonist on a basis of ten years' payment, or they could make a small payment on account and the balance could

be paid when the sum was realised. That system was put in force for the exclusive benefit of the people of Great Britain with the sanction of the President of the Canadian Pacific Railway. They wanted to have, scattered throughout Western Canada, areas settled by people from Great Britain, who would come out and assist them in leavening that great American mass, so that when the time came, as inevitably it would come in the near future, when they would have to face Canada's position in the empire, they would have, throughout that area, these small groups to help them—people who were imperialistic in sentiment.

He then pointed out the important part which Britain had played in colonising in years gone by, and as a Canadian he would say to those who were wanting to emigrate, Come to Canada, and he would tell them why. Ten years from now the balance of population in Canada would be west of Lake Superior, and, under existing conditions, that balance of population would be American in sentiment if they went on bringing

Breaking up the Prairie—the Steam Plough.

in so many from the United States. At the present moment they had a keen agitation in Canada and the United States for closer reciprocal relations with the States. There was a high tariff wall on both sides, erected by them on the Canadian side with a preference to Great Britain, and erected on the other side without a preference to anybody. Was it not perfectly justifiable to claim that political history showed that closer trade relations between countries were always followed by closer political relations? Therefore every single stone that they took off that tariff wall would decrease the demarcation of the boundary between Canada and the United States until the tariff walls were finally removed.

The great products of Western Canada for many years to come must be food stuffs, and the great market for these was in the British Empire. In the United Kingdom they had to depend upon the food stuffs produced by North America, and on what part? Certainly on Canada, because within three years the United States would be importing wheat. In this very year the United States did not produce very much more than they required, and therefore in the western portion of these States

they realised that, unless they could get reciprocity with Canada and bring in wheat from Canada they would be "horribly out of business," as they said in the West.

He had noticed that in the year 1910 the export trade of Great Britain had increased by some £17,000,000, which was very gratifying, and had been made possible because Britain had established markets all over the world. But they wanted Britain to go further than that and take such an interest in the trade development of Canada as a whole, and especially of Western Canada, that there could be no question of anybody else coming in and getting too big a share of it. The larger portion of the western trade was done by Americans. The British manufacturer got a very small part, and he (the manufacturer) might say that it was not worth while bothering about it. In Western Canada there was at the present time a great market for steel, for the products of the loom, for the larger proportion of the manufactured products of Great Britain except cotton, and twenty years hence there would be there one of the greatest markets for manufactured goods on the habitable globe. Mr. Dennis illustrated on a map the fact that the grain from Western Canada could be transported by two routes, and indicated that when the Panama Canal was completed, the grain products would go by the Pacific Coast and through the Canal to Britain,- and he asked why should not these ships return with goods?

Speaking on the question of climate, Mr. Dennis said he had received records from the meteorological expert at Calgary, and for the five days preceding Christmas they had not had frost, they had been playing cricket and tennis, and had had tea out of doors.

A NEW ATLAS OF ZOOGEOGRAPHY.[1]

THE publication of this magnificent volume marks an epoch alike in the history of geography and of zoology. Hitherto the chief work available for those seeking a graphic representation of the facts of animal distribution has been Dr. William Marshall's *Atlas der Tierverbreitung*, forming the sixth part of Berghaus' *Physikalischer Atlas*. Not only is this now some twenty-four years old, but it contains a very limited number of plates, with the result that the distributions are much crowded, and in many cases the maps demand detailed and laborious study before the facts represented can be deciphered. The special characteristics of the new atlas are the great number of plates which it includes, and the

[1] *Atlas of Zoogeography.* A series of Maps illustrating the Distribution of over Seven Hundred Families, Genera and Species of Existing Animals. Prepared by J. G. Bartholomew, LL.D., F.R.S.E.; W. Eagle Clarke, F.R.S.E., F.L.S.; and Percy H. Grimshaw, F.R.S.E., F.E.S. Bartholomew's *Physical Atlas*, vol. v. Under the patronage of the Royal Geographical Society. Edinburgh: John Bartholomew & Co., 1911. Price £2, 12s. 6d. *net.*

admirable clearness and simplicity of the printing which enables the facts represented to be read at a glance. To give actual figures, Marshall's *Atlas* contains nine plates, and gives the distribution of mammals, birds, reptiles, fishes, amphibians, beetles, butterflies, molluscs, domestic animals, and parasites. The *Atlas of Zoogeography* includes thirty-six plates, of which no less than seven are devoted to mammals, while the others include birds, reptiles, amphibians, fishes and their allies, molluscs, and representatives of most of the orders of insects. While in Dr. Marshall's *Atlas* one map records the distribution of the whole of the marsupials, the Sirenia, and some of the whales, the new atlas devotes five maps to the marsupials alone. One consequence of thus multiplying the maps is that broad washes of colour can be used, instead of mere coloured lines, and these add greatly to the beauty and legibility of the plates.

In addition to its thirty-six plates the atlas contains a large amount of text. Part I. discusses the general principles of distribution: Part II. gives a historical account of the different zoogeographical divisions proposed by different authors, and fully describes that adopted, which is Wallace's division into six regions, each of which is again divided into four sub-regions: Part III. gives descriptions of the maps forming the plates, and is followed by an extensive bibliography, forming Part IV. An index concludes the volume.

All the families of mammals, birds, reptiles, and amphibians are dealt with, and in addition most of the families of fishes, and a selection of families and genera of molluscs and insects. We understand that the atlas has been the result of many years of work on the part of the authors, and no one who even glances at the plates can fail to be impressed with the enormous labour involved, or fail to be grateful to them for gathering so great a mass of material into a form in which it can be studied with the minimum of fatigue. We heartily congratulate all those concerned with the production of the atlas on the happy result of their long labours, and feel that Edinburgh is also to be congratulated on the fact that so fine and so permanent a piece of work has been produced in her midst. That the bibliography runs to eleven folio pages shows that we do not suffer so severely from our distance from the great libraries of London as some would have us believe, and the whole atlas is a demonstration that Edinburgh is still a city of learning and of devotion to scientific work.

Passing to details, we may note that the first two plates represent graphically the zoogeographical regions proposed by different authors, the first giving, in addition to the central plate, which represents Wallace's regions, a map showing prevailing vegetation and ocean currents over the globe, and another indicating bathy-orographical configuration. Both of these latter maps are exceedingly useful in connection with the study of distributions, and we note that in all the distribution maps the area above 3000 feet is indicated by black dots. This is a very useful feature, as the animals which inhabit elevated areas are often quite different from those found in regions not greatly above sea-level. The last plate of all is based upon one in Marshall's *Atlas*,

and is intended to illustrate the vertical and altitudinal distribution of animal life.

When so many maps have been given it is perhaps ungrateful to ask for more, but we would gladly have sacrificed some of the Mollusca maps, and even some of the insects, for a map showing the remarkable distribution of that old-fashioned animal Peripatus. We are sorry also that earthworms and scorpions are omitted, for the distribution of both these groups has formed the basis of interesting investigations by competent authorities.

The figures illustrating altitudinal distribution seem to us most useful in the case of forms practically confined to certain levels, such as, for example, mountain animals like sheep and goats, or inhabitants of the tropical forest like the orang. In some other cases they may even be deceptive. For example, the long-tailed Asiatic monkeys called langurs are represented on one of the figures, and they are shown as ascending above 10,000 feet. But it is well known that of the thirty or so species the vast majority live at a low elevation, and only two, the Himalayan and the Tibetan langurs, are adapted to life at great heights. Would it not be possible to represent such facts by say a gradually diminishing thickness of line? It seems to us, also, that it might have been possible on the maps showing horizontal distribution to illustrate similar facts by varying intensities of tint, on the principle of a contoured map.

As an example we may take the case of the tree-frogs (Hylidae). The distribution of these interesting little animals is represented on Plate 21, where we see that they are absent from Africa south of the Sahara, from Arabia, India, etc., but are practically universal elsewhere. But in the account of the Australian region in the text we are told that they are characteristic of New Guinea, while under the Neotropical region we are told that they are characteristic of the Brazilian sub-region. In the description of the map on which their distribution is shown, it is pointed out that this is a case where colouring is deceptive—but could a modified colouring not have been employed? We may note that in Gadow's volume on Amphibia and Reptiles in the *Cambridge Natural History*, the essential fact—that only in America and in New Guinea (and the adjacent parts of Queensland) do other genera of tree-frogs occur in addition to the type genus Hyla—is shown by a very simple and instructive sketch-map.

Perhaps these suggestions are counsels of perfection, but when so much progress has been made, perfection seems in sight.

We note that in some cases the text and plates do not correspond very closely. Thus on the map the gorilla is shown as extending its distribution very much further east than the text-books suggest, while the text gives a more limited range. Much more marked is the divergence in the case of the curious aard-varks of Africa, of which the authors recognise no less than six species. Here in the text the northern forms are stated to extend "from Senegal eastwards," but the plate shows the distribution to which we are accustomed—that is, that the northern forms are found in eastern Africa extending into the

Egyptian Sudan—with the addition of a new small area near Cape Verd and another at Lagos. Sir Harry Johnston, it may be noted, doubts the accuracy of the western records.

The classification of animals adopted in the text seems marked by a little uncertainty of touch. Thus we have a *class* Mollusca with an *order* Cephalopoda, followed by *classes* of Gastropoda and Pelecypoda, suggesting to the logically-minded that the Gastropods and Bivalves are not molluscs.

But these are trifles compared with the mass of patient work of which the volume gives evidence, and we can only conclude by repeating our congratulations to all concerned in its production.

GEOGRAPHICAL NOTES.

Europe.

Greek Lands and the Greek People.—We have received a pamphlet with the above title, containing an inaugural lecture delivered by Professor J. L. Myres at the University of Oxford in November last. It will be remembered that Professor Myres lectured before the Society last year, and his lecture appeared in the issue of the *Magazine* for March 1910. His inaugural lecture deals with a particular aspect of the general problem discussed in his address to our Society, and will be cordially welcomed by all those who listened to that most suggestive address. Broadly speaking, the thesis of both lectures is that the race called "Mediterranean" displays a particular adaptation to the geographical conditions of life in the Mediterranean area, an adaptation which has enabled this race to keep its hold wherever the geographical conditions are typical. Throughout his history, however, Mediterranean Man has been exposed to the pressure of two types of intruders; first, pastoral nomads from the grasslands, which have swept into the area like a whirlwind, but which yet have been raiders and nothing more; and second, the slower infiltration of mountain types from the highlands, a much less conspicuous invasion, but, perhaps, because slower, more permanently important. With this latter type of intrusion Professor Myres compares the descent of Mongoloid peoples into the Malay peninsula, and the southern spread of the Bantu peoples in Africa. In all these cases a complicated highland separates a densely peopled area from one of relatively scanty population and easier conditions, and in all cases, he believes, the result has been much the same, the men of the uplands spreading slowly but steadily into the lower ground beyond.

As to the origin of the Greek people, Professor Myres considers that the evidence shows that all the three great stocks of Europe have contributed to their making. Prior to the days of Tartar invasions, he believes that the incoming pastoral nomads which swept down upon the region, were of the blond, northern (Nordic) type, and they seem always

to have shown little or no power of becoming acclimatised to Mediterranean conditions: perhaps, as Professor Myres suggested in his earlier lecture, because of the high infant mortality in the Mediterranean region. Alpine man, on the other hand, coming in from the upland regions, seems to have shown more power of adaptation.

Professor Myres goes on to discuss the food available in the three natural areas of the Mediterranean region, *i.e.* the forests, the maquis, and the grassland. The whole paper, as indicated, is extremely suggestive and interesting.

French Time.—At midnight on March 10th the clocks in France were put back 9 min. 21 sec., thus assimilating French time to Greenwich time. Henceforth, therefore, French time will be one hour behind Central European time.

America.

Distribution of Agricultural Produce in Argentina.—M. Pierre Denis contributed to the *Annales de Géographie* for November 15 last, an interesting article on this subject, based upon a number of recent publications. He noted, in the first instance, that many factors influence the distribution of agricultural produce; thus not only have soil and climate an important influence, but the distance of the ports and the relation to the railway, the state of the world's market, and the size of particular estates and the nature of their tenure, all exercise their effect.

As to soil, the plain of the Pampas, which includes the province of Buenos Ayres, a part of those of Cordoba and Santa Fé, with the area lying between the Parana and the Uruguay (Corrientes and Entre Rios), is far from being uniform throughout. As one travels from the west to the east the particles become finer, clays replacing sands. A band of some 60 miles in width and about 190 miles in length, extending along the Parana from Santa Fé to Buenos Ayres, has always had the reputation of including the most fertile land in the republic, and lends itself admirably to cultivation. Westward of this the soil becomes lighter and too permeable to retain moisture well. On the other hand, the land lying in the eastern region of the province of Buenos Ayres, and to the south of the estuary, is marshy owing to the fineness of the clay. The rainfall diminishes steadily from east to west, but the diminution is most marked to the north, owing to the greater heat and increased evaporation.

Looking at the region as a whole, agriculture in the strict sense is everywhere gaining upon the pastoral industries, and of agricultural crops, wheat shows the greatest increase. In the details of its distribution, however, wheat shows some curious anomalies. Thus there is but little grown in the fertile strip along the Parana described above, while there has been a marked increased growth towards the west, in the regions believed to be less fertile. The great wheat area has the form of a band which sweeps in the form of an arc of a circle from Santa Fé

to Bahia Blanca, covering the west of the province of Buenos Ayres and encroaching upon the provinces of Cordoba and of the territory of the Pampas. In this area lie two great centres whose respective outlets are Bahia Blanca and Rosario. The eastern part of the province of Buenos Ayres is too damp for wheat. Generally speaking, then, on comparing the results of the agricultural census of 1908 with that of 1895, wheat cultivation seems to have spread southwards, but by a curious anomaly it has also spread greatly in the western part of Santa Fé, in the latitude of 31° N. This last area is due to the westward extension of the colonists who established themselves near the town of Santa Fé in 1855-1870. Here small estates are the rule, and the inhabitants may be called indigenous, as they have been established for more than a generation. Maize will not grow here, and the small estates make intensive cultivation necessary, facts which explain the great extension of wheat.

This westward extension of wheat towards Cordoba is the more remarkable in that the wheat is being grown on lands reputed to be somewhat infertile. But it is by no means certain that the wheat will keep its hold throughout the whole of this area. It is the custom for large holders here to let portions of their land for periods of five years for wheat. When the natural fertility is exhausted at the end of this period, the cultivator puts the land down to lucerne and it reverts to its original owner. Some of the wheat is thus merely a stage in the conversion of natural pasture into fields of lucerne.

Maize is grown over a much more limited area than wheat. It is found in a triangular area whose base is formed by the Parana from Santa Fé to Buenos Ayres, while the summit is in the west of the province of Buenos Ayres, the greatest density of the crop being on the fertile clays near the Parana. This region also grows flax, and is the only region which has been found suitable to that crop.

As to cattle and sheep, some interesting points emerge from the census. Speaking generally, sheep are being pushed southwards by the development of agriculture to the north. On the other hand, in the northern angle of the province of Buenos Ayres they have maintained their hold in a surprising fashion, even on land where wheat and flax are being cultivated, suggesting that by scientific methods sheep can be made to pay, even on fertile land. The sheep are being more and more reared for their flesh (frozen mutton), instead of for their wool.

The displacement of sheep is not only due to the spread of agriculture but also to the fact that they soon destroy artificial pastures of lucerne, which will, on the other hand, maintain cattle for many years without renewal. These lucerne pastures are introducing great changes into the cattle industry. Round Buenos Ayres especially it is becoming more and more the custom to purchase cattle from the more remote districts where they are bred, and then fatten them rapidly on the rich lucerne pastures for the frozen meat industry. In the province of Buenos Ayres generally, this highly profitable industry is tending more and more to replace the breeding of cattle, and it yields profits equal to those obtained by the cultivation of cereals, provided that the market is sufficiently near at hand.

Australasia.

British Expedition to Dutch New Guinea.—Mr. Walter Goodfellow, the leader of this expedition, has been invalided home, and has supplied the daily press with some further details of the work of the expedition. The party landed at the mouth of the Mimika river, and followed this river to the mountains at its head. Here they reached very difficult country, intersected by innumerable rivers. Indeed the whole country here, from the mountains to the coast, consists of swamp, through which run many rivers, which all swell enormously in the wet season. At the head of the Mimika river further progress was blocked by the snow-capped mountains which rose sheer from the plain, and the party turned eastwards, and endeavoured to force its way through the dense growth of the swamps. In the first day's journey to the east no less than thirty rivers and streams were crossed, and the sudden flooding of these streams may make progress either backwards or forwards impossible for weeks at a time. The dense forest is another great obstacle. On one occasion it took three weeks for the men to hew a track through the jungle for a distance of only two miles. The trees are bound together by vines, creepers, and thorns, and when these are cut through showers of stinging ants and hornets are brought down. The difficult country placed great obstacles in the way of extensive collecting, but Mr. Goodfellow states that the scientific results are nevertheless rich.

On the Mimika river the natives were found to have only stone weapons, but they soon perceived the value of the iron axes which the party had brought with them, and were very ready to barter anthropological specimens, including their stone axes, for these. In each village one old man at least was found who sharpened the stone axes for the rest of the community. The men make the canoes, help to build the huts, fashion weapons, and sometimes hunt or fish; all other duties devolve upon the women, who spend much of their time in collecting sago and firewood. A fermented drink is made from the sap of a sugar palm, with which the natives frequently make themselves intoxicated. Cannibalism is not practised as a regular custom, but enemies killed in warfare are eaten, and raids seem even to be made for the purpose of obtaining human flesh. Of the pigmies discovered by the expedition (*cf.* vol. xxvi. p. 377), men only were seen, not women nor children. The skin of these peoples is lighter than that of the lowland natives, and the intelligence appeared to be low. Flies were extraordinarily numerous in the forest and tended to contaminate the food of the expedition. Mosquitoes were less abundant.

General.

The Sub-tropical Climate.—In two recent issues of the *Geographische Zeitschrift* there appears an interesting article by Mr. F. Thorbecke on what he calls the oceanic sub-tropical climate, the article being of the nature of a summing up of recent work on the subject. Thus, though it

does not contain a great deal of absolutely new material, it brings together in a convenient form many useful facts and deductions.

The sub-tropical zone lies in about lat. 30°, between the trades and the westerlies, and is a region characterised by high atmospheric pressure. This high pressure is due to the fact that the region is, as it were, fed by two air currents, the anti-trades, westerly in direction, and the currents which stream out of the polar whirl, and are north-westerly to the north and south-westerly to the south. But the existence of the continents interrupts what would otherwise be the continuous sub-tropical band, and we find that the characteristic belt of permanent high pressure exists only over the ocean and to the west of the continents, and is completely absent to the east of the continents. Further, the annual movements of the trade belt zone cause the sub-tropical zone to move also, so that, according to the seasons, its position varies between 28° and 40°. The fact that the trade winds thus encroach upon it in summer gives it the characteristic rainless summer, while the southern extension of the south-west winds of winter (in our hemisphere) give it the familiar winter rains. The junction between the sub-tropical zone and the tropical zone is almost everywhere marked by a belt of desert, lying over the region which is permanently within the rainless trades.

The fact that the typical sub-tropical zone does not occur over continents or on their eastern border, need not be enlarged upon. It is well known that the differential cooling of land and sea leads to the production here of a continental monsoon climate, with summer rains. But this, of course, occurs especially in the northern or land hemisphere, while in the southern or water hemisphere the régime of the oceanic climate is much better developed. This is well seen in South America. Here, to the east, the flat plains in front of the Andes are open to the trades all the year through, but, owing to minor variations of pressure, the tropical region passes gradually into a region where rain is equally distributed throughout the year.

On the west the conditions are very different. Here a long rainless stretch completely separates the tropical region of summer rains from the sub-tropical region of winter rains, which extends southward to 42° S., and then, as in western Europe, passes into a region of westerly winds with rainfall equally distributed throughout the year. As in the "Mediterranean" region of Europe the climate is mild, the winters not being severe and the summers not very hot, hence the term "oceanic sub-tropical" applied to this climate by the author. A quite similar condition occurs in western North America, in the region of California.

While in western South America, as in Europe, we have an oceanic sub-tropical climate bounded in one direction by desert and in the other by a temperate climate with prevailing westerly winds and uniformly distributed rainfall, in both South Africa and Australia there is no temperate zone, the land ceasing with the sub-tropical zone. Otherwise, in spite of the obvious difference in shape between Africa and South America, their west coasts generally resemble each other in climate. But in Australia, owing to the absence off the west coast of the cold currents which wash the western shores both of South America and

southern Africa, the winter rains extend much nearer to the tropical zone than in the case of the other two.

In the Mediterranean region, as is well known, the type of climate called by the author oceanic and sub-tropical reaches its maximum development. Nowhere else does it penetrate so far inland, and nowhere else does it extend so far to the north. It is the great development of this type of climate within the area that justifies the common use of the term "Mediterranean" for it. The author describes the conditions which reign here in considerable detail, but as the main facts are summarised in most text-books, we need not repeat them.

Forthcoming Congresses.—In addition to the International Congress of Geography to be held at Rome in the coming autumn, various other congresses, bearing upon geography, are to take place this year. Thus we have received an intimation in regard to the First Universal Races Congress, to be held at the University of London from July 26-29, under the presidentship of the Right Hon. Lord Weardale. The special object of this congress, which has a very strong Executive Committee, is "to discuss, in the light of modern knowledge and the modern conscience, the general relations subsisting between the peoples of the West, and those of the East, between so-called white and so-called coloured peoples, with a view to encouraging between them a fuller understanding, the most friendly feelings, and a heartier co-operation." In connection with the Congress there is to be an exhibition of books, documents, photographs, skulls, charts, etc., which is under the direction of Professor Haddon of Cambridge. Applications for membership, or for further details, should be addressed to Mr. G. Spiller, 63 South Hill Park, Hampstead, London.

Another congress to be held this summer is the National Congress of French Societies of Geography, to be held at Roubaix under the presidentship of Prince Roland Bonaparte, from July 29-August 5. The subjects discussed are to include general geography and the special geography of France and her colonies. Further details may be obtained on application to 160 Boulevard de Reims, Roubaix.

EDUCATIONAL.

A RECENT Memoir of the Geological Survey of Scotland should prove of much interest to teachers. This is a *Catalogue of Photographs of Geological Subjects*, published at the price of 6d., and giving details of the first 1913 photographs taken by the Geological Survey to illustrate subjects of geological interest in Scotland. The details given include the number, subject and locality of each photograph, and the number of the one-inch map in which each locality occurs. The photographs illustrate chiefly districts in the North-West Highlands, in Skye, in the counties of Argyll, Perth, Aberdeen, Kincardine, Fife, Haddington and Mid-Lothian, and while many give details of rock structure and are thus geological, others represent characteristic types of Scottish

scenery. Of these latter not a few examples have at different times appeared in the *Magazine*, and teachers who have admired Mr. Lunn's work here will be glad to learn that negatives, prints, lantern-slides, and bromide enlargements of all his photographs can be obtained at a fixed tariff on application to the Director, Geological Survey, 33 George Square, Edinburgh. Prints from the original negatives may also be seen at the same address.

The catalogue not only contains a list of the photographs but also an elaborate index, enabling those in search of illustrations of a particular phenomenon or of a particular area to find readily if this is obtainable or not. We strongly recommend the series of photographs to the notice of teachers.

We have received from Messrs. George Philip and Son a series of improved Contour Outline Maps, which can be supplied at very cheap rates for class use. The series includes both maps of large areas, as continents and countries, and also district maps, of which North London and South London have been published. On the small scale-maps the contours shown are 600, 1200 and 3000 feet, and on the district maps 200, 400 and 600 feet. The contours are shown by means of different kinds of lines, which increase in intensity on passing upwards from sea-level, so that the lines gave a certain graphic indication of height. There is no printing on the maps, but the position of large towns is shown by circles. The maps are intended to be coloured by the pupils, and to be used in other exercises. As the publishers note, they might well be used for mapping distributions, and tracing routes. The maps should, we think, prove very useful. In the case of regions with bold and simple relief, the effect of the different kinds of lines is very good, notably in the case of South America, where the contrast of plains and mountains is well shown. The limitation of the highest contour line to the comparatively low elevation of 3000 feet rather destroys the effect in countries of high relief, notably in Asia, where the structure of the complex central region is obscured.

Our Teacher Associate Members will be glad to learn that the *Daily Weather Report of the Meteorological Office* has been added to the Library, and is received every morning. The Reports are posted upon the board, where they may be consulted by members.

NEW BOOKS.

EUROPE.

Voyage en Automobile dans la Hongrie Pittoresque. Par Pierre Marge. Second Edition. Paris: Plon, 1910. *Price fr.* 3.50.

M. Marge's delightful account of his motor car trip through Spain was reviewed in this *Magazine* for December 1909. He describes in this volume a similar journey made by him in company with M. Herriot, Mayor of Lyons, who writes the Preface. They reached Vienna from Geneva, and then visited the battlefield of

Wagram won by Napoleon in 1809. After wretched Austrian roads they found good ones in Moravia to its capital Brunn. There they visited the field of Austerlitz where Napoleon triumphed in 1805. Moravian scenery was monotonous and the people spoke nothing but Czech. Passing on to Teschen, the principal town of Austrian Silesia, they found the people only spoke Polish. The country was the abode of dulness and poverty, full of dirty Jews, and with bad roads. Cracow is an extremely interesting town of 100,000 inhabitants, of whom over one-third are Jews. Once the capital of Poland (it was superseded in 1610 by Warsaw), it is now not even the capital of Galicia, Lemberg being preferred. A University was however built in 1887, the old one, a veritable marvel of Gothic art, dating from 1492.

The Russian frontier being quite near Cracow, our travellers thought they would test the worth of the famous "Franco-Russian alliance" by crossing it, but they got such a rude reception from the Russian soldiers and police, that they were glad to return to Austrian territory. They visited the salt mines of Wieliczka, the chief curiosity of the environs of Cracow, and then made for the Carpathians and Hungary. The mud on the roads now became so deep that the car's wheels were half embedded in it. Slovaks of Greek Church persuasion formed the population. At last the Tatra part of the Carpathians was reached, and by means of a funicular railway our friends ascended to the "Palace Hotel," which commands a magnificent view of the chaos of plains, mountains, and forests surrounding the Lake of Csorba. Their powerful 100-horsepower car took them swiftly through Hungary of the Carpathians and then they entered that of the Magyars, that race which conquered the Slavs in A.D. 889 and established themselves on the great fertile plain known as the Alfold. From the Magyar capital, Budapest, they proceeded to Agram, the capital of Croatia, and finally reached Trieste. The book would have been valuable to motorists if it had contained a map showing the author's route, with distances, inns, etc. M. Marge's previous book was similarly faulty, but also similarly entertaining.

Colonsay: one of the Hebrides. By MURDOCH M'NEIL. Edinburgh: David Douglas, 1910. *Price* 3*s.* 6*d.*

This little book gives an exceedingly interesting account of the plants, climate, geology, legends, etc., of the island of Colonsay, and contains much of definitely geographical value. We note especially the accounts of the introduced shrubs, evergreen or deciduous. It is surprising to hear that such shrubs as Escallonia, Aucuba, Aralia, Fuchsia, etc., will thrive so far north as the Hebrides, and we learn also that a Chamaerops and a Yucca are living out of doors, and that the latter flowered freely in 1907. Such facts throw a surprising light upon the mildness of the climate. Of great interest also is the brief discussion of the effect of stock upon the pastures of the island. The author's conclusion is that sheep injure the pastures, and that rough pastures in general are most economically grazed by mixed stock. It is noted that in the planted woods the rhododendron seeds itself abundantly, the seedlings springing up in all directions. We recommend the book cordially to the notice of geographers.

Corruption and Reform in Hungary: A Study of Electoral Practice. By R. W. SETON-WATSON (Scotus Viator), D.Litt., Oxon. London: Constable and Co., Limited, 1911. *Price* 4*s.* 6*d. net.*

The author, a Scotsman and member of the Society, has become celebrated as the champion of the Slovaks, Roumanians, and other races subjected to Magyar

rule in Hungary. In this volume he exposes "the almost unparalleled corruption and violence which characterised the general elections of June 1910," and shows "the urgent need of electoral reform of the most thorough kind as the only means by which Hungary can be saved from irreparable disaster." It is a sequel to his *Racial Problems in Hungary* reviewed in this *Magazine* for May 1909. Like that book, this contains a very serious indictment of the Magyars, a Turanian race which has ruled Hungary since A.D. 1000, and which, in the days of Louis Kossuth, received the unreserved sympathy of Britain when the Magyars freed Hungary from Austrian domination. Yet, according to the author, "Electoral freedom of speech and action is a mere farce wherever Opposition voters are concerned, and is continually violated in the case of Non-Magyar candidates." He declares that "in Hungary there can be but few parliamentary elections which would not be annulled in England or Germany." He demands for Hungary the universal suffrage which has become an accomplished fact in Austria, "and with it the emancipation of nationalities from their present political bondage." As, however, the Non-Magyars are more numerous than the Magyars, and as universal suffrage would place the latter in a minority in the Hungarian Parliament, the Magyars are not inclined to abandon their present political hegemony. Like its predecessor, this book is a treasure-house of facts and statistics, and we commend it to Hungarian reformers.

The Building of the British Isles. Being a History of the Construction and Geographical Evolution of the British Region. By A. J. Jukes-Browne, B.A., F.R.S., F.G.S. Third Edition, rewritten and enlarged. Illustrated by Photographic Views, Maps, and Sections. London: Edward Stanford, 1911. *Price* 12*s. net.*

This is called a third edition, but it has been almost entirely rewritten, and greatly enlarged, the maps and sections recast, photographic illustrations added; so that it is practically a new book. Mr. Jukes-Browne's previous work is too well known to require commendation here, but it may be said that he has if possible enhanced his reputation by this scholarly treatment of the branch of geology which he has made peculiarly his own. As we trace with him the growth of our islands, epoch by epoch, one might say, year by year, from the still glowing crust of the beginning to the complex structure of the present day, we are filled with admiration at the skill with which he marshals his facts and draws his inferences, and, above all, confines them into the limits of one volume of 470 pages. The very maps which give the geography of the British Region at the various geological epochs are a triumph of reasoned scientific imagination. Yet they are not, in any sense of the word, fanciful. We are sure that not only the student but the general reader who is interested in what may be called Prehistoric Geography, will give this work a hearty welcome.

Highways and Byways in Cambridge and Ely. By the Rev. Edward Conybeare. London: Macmillan and Co., Limited, 1910. *Price* 6*s.*

The highways and byways of Cambridge and Ely afford ample material to an enthusiast and expert like the Rev. Mr. Conybeare for the compilation of a work of very great interest. He has brought to his task many special qualifications, which will commend him to our readers. No part of England has been the scene of more stirring events in history, such as the repeated invasions by the Danes, and their struggles for conquest until they were finally worsted by King Alfred, the war of the Commonwealth, and the wild iconoclasm of the Puritans, with its

disastrous results to many magnificent specimens of architecture ; and Mr. Conybeare has evidently made a minute and careful study of the political history of the locality. Not less minute and interesting is his account of the quaint and curious ecclesiastical legends and traditions, which are inseparably connected with the churches and especially with the noble cathedral of Ely ; and he is an efficient and unwearying exponent of the many architectural features and beauties for which the colleges and churches of the locality are justly famous. He has recorded also many local traditions and stories, which were in danger of perishing in course of time. In the realm of literature he has in connection with Cambridge *un embarras de richesses*, Erasmus, Milton, Pepys, Coleridge, Paley, Macaulay, Kingsley, to mention only a few ; in science, he has Sir Isaac Newton, Adams, and Darwin. In every branch and ramification of his subject Mr. Conybeare has no difficulty in interesting his readers, and the variety of his material is so great, that the interest is maintained to the end. The many illustrations by Mr. F. L. Griggs merit special commendation.

Mountaineering in the Land of the Midnight Sun. By Mrs. Aubrey le Blond, author of *True Tales of Mountain Adventure*, etc. London and Leipsic : T. Fisher Unwin, 1910. *Price* 10*s.* 6*d. net.*

Mrs. Le Blond's books are always pleasant reading. A true lover of the mountains, she writes of climbing with an enthusiasm which is kept within due bounds by wholesome respect for their dignity. In this volume she proves that Norway, if familiar to the sportsman, yet possesses many peaks and passes and glaciers where the mountaineer may reach the height of his ambition and tread upon unknown ground. If she has reduced this enchanted area by her own efforts she nevertheless makes it clear that she has left something over for the next-comer. The numerous illustrations are from photographs and are as good as photographs can be.

Venice in the Thirteenth and Fourteenth Centuries ; a Sketch of Venetian History from the Conquest of Constantinople to the Accession of Michele Steno, A.D. 1204-1400. By F. C. Hodgson, M.A., Fellow of King's College, Cambridge. London : George Allen and Sons, 1910. *Price* 10*s.* 6*d. net.*

For the ordinary tourist there are handbooks of all sorts, but Mr. Hodgson frankly does not write for this class. It will be remembered that some years ago he published a volume on the *Early History of Venice*, a book which he says somewhat sadly was found rather dry, and attracted few purchasers, but students and critics recognised its great merit, and will welcome a further contribution from the same author. It is not possible to follow in detail a work characterised by so much careful and accurate research, but it will be sufficient to indicate that the keynote, so to speak, is that while Venice was a Republic in name, it had nothing whatever in common with any other form of government going by that name. It was not founded on the doctrine of equality, had no sympathy with such ideas as those of the French Revolution, but rather held that the art of governing a country was a very serious business which involved a special training from early youth, and which was even furthered by inherited talent. Without making any comment, it is well that this point of view should be kept in mind while studying Venetian history.

One advantage which the student has is that the chronicles of those times were not written by churchmen as in so many other countries, but by men of business of a good education, who from their position were in touch with current events.

Venice in the Thirteenth and Fourteenth Centuries is a valuable contribution to the history of that period.

A Roman Frontier Post and its People: The Fort of Newstead in the Parish of Melrose. By James Curle, F.S.A. (Scot.), F.S.A. Pp. xx + 432. With plans and 97 plates and many other illustrations. Glasgow: James MacLehose and Sons, 1911. *Price* 42*s. net.*

It is probably no exaggeration to say that this is the best piece of antiquarian work that has ever been done in Scotland. Certainly it is so as regards the period of the Roman occupation. The matter seems to have been well managed throughout. When the owner of the ground in 1904 chanced to discover remains of masonry, he requested the Society of Antiquaries of Scotland to take charge of the excavations, and they in turn entrusted responsibility for the supervision of the work to the capable hands of Mr. James Curle, whose residence was but a mile from the site. For fully five years he has guided the labours of the spade and seen the growing interest of the returns,—for some of the latest finds have been among the richest. The fields, which on the surface betrayed no evidence whatever of the treasures concealed below, have now revealed the record of the most important military station of the Romans in Scotland, and have yielded an unsurpassed wealth of museum objects—some of high artistic value—which as a collection throw a new and vivid light not only on the Roman occupation of our country in the first and second centuries but on the Roman civilisation of the period.

This volume is the worthy culmination of the work, and it is to Mr. Curle's personal labours that we most of all owe our thanks. For without the intimate knowledge he possesses of the Roman remains of Great Britain and the Continent and of the literature to which they have given rise, the true import of the Newstead excavations would never have been so worthily expiscated. It is to the comparative method, infinitely laborious in detail, that we must attribute the permanent value of the book. In fact it constitutes a mine of original information to which, for long, research must turn, and more than that, its learned but most readable pages offer a singularly comprehensive survey of the varied aspects of the subject, such as dress, weapons, pottery, coins, etc.

One lesson of the excavations is clear. The fort itself has yielded no objects more interesting than have the ancillary enclosures. It was in them in particular that the two beautiful helmet-masks were found, in one case with some of the padding still attached. It is possible that the judicious work at Newstead will guide others to exploration in richer fields elsewhere till now neglected.

No reader of the book can fail to be struck by the admirable clearness of the type and of the illustrations. The coloured plates are especially notable, and the publishers deserve our warmest recognition. We will only add in conclusion our recommendation to all who can to inspect the display of treasures from Newstead which is on view in the museum of the Society of Antiquaries of Scotland.

ASIA.

Le Far-West Chinois, Kientchang et Lolotie, Chinois-Lolos-Sifans, etc. Par le docteur A.-F. Legendre. Illustrated. Paris: Librairie Plon, 1910. *Price* 5 *fr.*

This is Dr. Legendre's second book on China, and is the result of a further sojourn of three years in the upper basin of the Yang-tse close to the Tibetan border. It is more like a German than a French book of travel, for it is exhaustive, rather minutely topographical, and more than a little dry. The author did a

great deal of marching and counter-marching in a little-known region, and he was mostly alone, save for the occasional company of a passing missionary. It is interesting as showing how the Chinese, the "fils de Han," as he is called with somewhat monotonous frequency, has failed so far effectually to colonise this region. Instead of gaining the confidence of the aborigines—"ces grands enfants"—he actually attempted to coerce them, with the result that after a brief triumph he has gradually been driven back until the sole part of Kienchang and Lolotie in effective occupation is the valley of the Ngan-Ning. Much information is given on the most various points, and in particular the disastrous effects upon a primitive people of the misuse of opium have ample illustration. There is one very "sketchy" sketch-map, which, however, may be only badly reproduced, as the author seems to have carried out a very careful route-survey.

Cyzicus. By F. W. Hasluck, Fellow of King's College, Cambridge. Cambridge: At the University Press, 1910. *Price* 10*s. net.*

The ancient and once important and wealthy city of Cyzicus was situated on the southern side of the Sea of Marmora, having on its east the gulf of Panderma and on its west the bay of Artaki. On the north it faced Kapu Dagh, an island or a peninsula, for the question cannot now be finally settled: Mr. Hasluck, however, gives good reasons for pronouncing it a peninsula. Tradition assigns a date to the foundation of the city some thirty-four years after the foundation of Troy, and King Cyzicus appears in the story of the Argonautic expedition; but little weight need be attached to these legends. Its position on the Sea of Marmora attracted a mixed population. It shared in the general prosperity and mixed fortunes of the maritime cities, and played a more or less important part in the many wars in the Near East for which we have authentic records. At last it fell under the blighting rule of the Turks, and, to-day, of the once prosperous and important city there remains but some "meagre and uninteresting ruins"; and the site of the ancient Cyzicus is given over to vine and mulberry culture by the inhabitants of the adjoining villages. In this erudite and instructive monograph, issued in the Cambridge Archæological and Ethnographical Series, Mr. Hasluck has brought together almost everything that has been ascertained about the ill-fated city, its topography, history, religion, government, etc., and he has added several lists of inscriptions, etc., of special value to the antiquarian and numismatist. From the preface we learn that Mr. Hasluck assisted in the survey of the locality between the years 1902 and 1906. He has obviously made a patient, exhaustive, and impartial study of all the data, ancient and modern, now available for the elucidation of his subject. He by no means claims to have solved all the questions and problems connected with it, but he has undoubtedly made a very valuable contribution to the existing literature, already very considerable, as appears from the bibliographical list, which is not the least useful part of his work.

Mining in Japan. Published by the Bureau of Mines. The Department of Agriculture and Commerce of Japan, 1909.

This interesting and instructive volume is a good illustration of the enterprise and pushfulness of the present administration in Japan. Having learned that "among foreigners who are interested in mining there is no small number who make inquiries regarding the past history and the present condition of mines in Japan," the Bureau of Mines, a sub-division of the Department of Agriculture and Commerce, decided to provide and publish the required information. We have

accordingly in this volume a succinct but compendious account of mining in Japan, its past history, and its present condition and prospects. The past history is interesting, mostly, if not solely, from an antiquarian point of view. The present history dates only from 1867, the restoration of the Meiji period. It is, of course, beyond the scope of this *Magazine* to give even an epitome of the information contained in this book, but we may say that any of our readers who are interested in the subject will find in it almost everything they could wish to know regarding the mineral resources of the Japanese Islands, and the conditions, legal, economic, and social, under which mining can now be carried on there. As a matter of more general interest we may note some of the social conditions of Japanese miners at the present day. At the end of 1908 they numbered slightly over 200,000. Families live in separate rooms, single men in barracks, supported by mine owners. They frequently get their provisions at low prices from their employers, who also provide them with "comforts and amusements,"—*e.g.*, plays, wrestling, saké (a Japanese wine). "There are organised memorial services for those who have died violent deaths. Priests are invited by the miners that they may hear their sermons. In some mines preaching houses or chapels have been specially erected." A modified "Workmen's Compensation Act" is in force. "There exist peculiar usages among miners. When the young men's ability regarding the practice of drilling and blasting are recognised, they are promoted and enlisted as 'miners' with dignified ceremonies in the presence of their own bosses and fellow-workers. The oaths of allegiance to chiefs by protégés and to their brethren are observed with religious strictness. It is expected that the instructions of the boss are to be obeyed whether they are right or wrong." Strikes are almost unknown. In "respectable" mines there are mutual-aid societies to which both miners and owners contribute monthly. It is clear that the Government is carefully watching and fostering this important but undeveloped industry, and is applying to it what they think are judicious measures borrowed from the West, while they conserve the indigenous practices, which appeal to the patriotism and religion of the miners—a statesmanlike policy, eminently characteristic of the liberal-minded Japanese.

The Ceylon Government Railway: A Descriptive and Illustrated Guide. Mainly extracted from the Author's larger work The Book of Ceylon. By Henry W. Cave, M.A. (Oxon.), F.R.G.S. London: Cassell and Co., 1910. *Price* 3*s. net.*

We reviewed here (vol. xxiv. p. 329) Mr. Cave's larger book, but noted that its size somewhat diminished its usefulness as a guide-book for the traveller. The issue of the present volume, much smaller and more compact, will therefore be a real boon to those who intend to visit Ceylon. Though based on the larger book, it has been brought up to date, notably by the addition of a section on the recently-opened Negomboo line, and modified in some respects. It thus forms an excellent handbook to Ceylon.

Across the Roof of the World, by Lieut. P. T. Etherton, F.R.G.S., F.Z.S., 39th Garwhal Rifles (Indian Army). London: Constable and Co., Ltd., 1911. *Price* 16*s. net.*

Lieut. Etherton's book contains a story of his journey through Kashmir, Gilgit, Hunza, and over the Pamirs ("the roof of the world"); thence through Chinese Turkestan, Mongolia, and Siberia to the Trans-Siberian Railway, a distance of over 3000 miles, through the lesser known parts of Central Asia. The journey occupied twelve months, and is one which, the writer says, "no man had ever done before."

It was undertaken more for purposes of sport than of exploration, and Lieut. Etherton naturally regards things mainly from the point of view of the sportsman; but he has much to tell of little-known regions and of the tribes which inhabit them, and his story is told in a modest and simple fashion which in no way detracts from its interest as a record of real travel. He is to be congratulated upon the safe accomplishment of a very arduous piece of work, calling for high qualities of courage and leadership.

The region known as the Pamirs consists of a lofty plateau, with a mean elevation of 15,000 feet, which connects the western end of the Himalaya range with the Hindu Kush, and extends as far as the Thian Shan mountains to the north. It is traversed by many deep valleys, with their snow-fed torrents, and is visited by frequent snow and sand storms which render it dangerous for the traveller. Leaving Srinagar in the month of March, Lieut. Etherton crossed the Himalayas to Gilgit, two months before the open season, and he tells how the post-runners, who maintain connection with the distant frontier post of Gilgit during the winter, are exposed to peril from the frequent avalanches which sweep the mountain sides. Indeed, a few hours before he passed one point on his route, two of them had been overwhelmed and buried alive, while he and his party narrowly escaped a like fate. From Gilgit, the way lies through the Hunza Valley to the Mintaka Pass, by which the Pamirs are reached. Beyond the Pass coolie carriers were exchanged for yaks, the only animals which can negotiate the tracks on the Pamirs and stem the torrents which have to be forded at frequent intervals. The highest pass which Lieut. Etherton crossed on the Pamirs on his way to Yarkand he calls the Qoqoi Qotchkor—a name of which the orthography is perhaps capable of improvement. The height marked here by the instruments was 17,400 feet, and this and other desolate and forbidding passes, where the snows lie thick, and where storms are frequent, make the task of winter travel one of almost incredible hardship. The main attraction in the Pamirs for the author lay in the pursuit of the white breasted Argali (*Ovis poli*), which, though a sheep, is a magnificent animal about the size of a donkey, with the hide of a deer, and horns which, in some of the best male heads, attain a length of 48 inches, and of which he succeeded in bagging some good specimens. The Kirghiz who inhabit these desolate regions appear to be a happy and hospitable folk on the whole, though existence must be hard for them in the winter.

After crossing the heights of the Pamirs, the next stage in Lieut. Etherton's long trek was by an unknown route to the Kualan Urgu Valley, and by the valley of the Yarkand River to Yarkand and Kashgar in Chinese Turkestan. Here, the Chinese, although they are the ruling race, do not form more than 5 per cent. of the population, and little is seen of them; but the Chinese Ambans and other officials received the traveller with courtesy and every mark of distinction, though it puzzled them to know why a British officer should endure the hardships of a journey from India merely for the sake of sport. A Consulate was established at Kashgar in 1908 by the Government of India, and Lieut. Etherton remarks that the result has proved to be beneficial in every way. The country between Yarkand and Kashgar is a stony waste, "a desperately uninteresting land and a good sample of what Chinese Turkestan really is." The people of Kashgar appear to be content to remain under Chinese rule after their experience of the desolating war that succeeded the revolt under Yakub Beg in the sixties of last century.

Leaving Kashgar on July 3, 1910, Lieut. Etherton's next stage was the long desert march by Kuchar and the Great Yulduz Valley to the happy hunting grounds of the Thian Shan mountains, where he found compensation for the hardships and privations which he endured by the way in the shape of a good bag of

ibex and Asiatic wapiti. The valleys of the Thian Shan are the haunt of Kalmuk and Kazak Tartars, pastoral nomads, who dwell in "Auls," or felt tents, and we have some interesting notes on the habits and manner of life of these peoples. Lieut. Etherton found the Kalmuks good fellows to live with, but he was glad to see the last of the Kazaks, whom he found to be lazy, stupid, and thievish in their ways.

Beyond the Thian Shan the route lay by the valleys of the Tekkes and Ili rivers to Kulja. The two rivers are known, after their junction, as the Ili, and they find an outlet in Lake Balkash, one of the largest lakes in Central Asia. The western corner of Chinese Turkestan, which is watered by the Ili, is rendered of especial interest at present owing to the dispute between Russia and China and the threatened re-occupation of this region by the former Power. It is a rich and fertile region, and in this regard it forms an exception to the howling wastes of sand which go to make up the most of Chinese Turkestan. Russia maintains a Consul-General in Kulja, and the latter, being near the borders of Siberia, is the centre of a considerable trade with Russia. The nearest railway is at Tashkend, some 600 miles to the west of Kulja, while the main road of the Trans-Siberian lies about 1000 miles to the north.

After Kulja, Lieut. Etherton's next objective was in the Great Altai mountains, in Mongolia, where he hoped to hunt the Ovis Ammon. Leaving Kulja on November 12, 1910, when the country was already in the icy grip of winter, he pushed on to the valley of the Black Irtish river and attempted to cross the Great Altai range, in the teeth of all the advice and warning which he received as to the dangers involved in the proceeding. He risked his own life, and the lives of his followers, in an attempt to make the crossing in the midst of the terrible blizzards which render winter travel in these regions impossible, at any rate at high altitudes. The faithful Garwhali orderly, who had accompanied him all the way from India, got frost-bitten in both hands, and his master did not escape without a dangerous frost-bite. There was nothing for it but to abandon the intended expedition in the Altais and get within reach of medical aid as soon as possible. A forced march brought the party to Zaisan, a Russian outpost on the borders of Mongolia and Siberia, and there the skill of the Russian military surgeon saved the lives of both the author and his orderly. From Zaisan, a sledge journey of 800 miles over Siberian post roads to Nova Nicolaevsk, where the railway was reached, seemed but a pleasure excursion, compared with former experiences, although the temperature fell at times to 50 below zero, and, once at the railway, the long journey was done.

On the possibilities of a railway being made northward from India to Siberia, Lieut. Etherton prefers not to hazard a definite opinion, since the question is one for the engineer, but he says that, from his own observations, such an undertaking seems impracticable, owing to the lofty mountain ranges and other physical obstacles to be overcome.

Amurath to Amurath. By GERTRUDE LOWTHIAN BELL, Author of *The Desert and the Sown*, etc. Illustrated. London: William Heinemann, 1911. *Price* 16*s. net.*

This remarkable book is a worthy record of a remarkable journey. During the five most critical months of the constitutional crisis in Turkey, Miss Bell travelled from Aleppo to the Euphrates, down that river to Babylon, across to Baghdad, up the Tigris to near its source, over the Euphrates again, and then along the middle of the plateau of Asia Minor to Konia. All along her route she found evidence of the intense interest taken by all classes in the new movement, and in the Preface,

addressed to Lord Cromer, she speaks hopefully of the prospects of the Turkish Empire under the new rule. The plain tale of Miss Bell's relations with her personal followers and of her intercourse with the inhabitants of the various places she passed through is worthy of the best traditions of British travellers. The beginning of the first chapter, with its amusing and understanding account of the "tortuous arts of Oriental commerce," is a proof of the author's qualifications for dealing with Eastern peoples; and frequently in the book we have little pieces of ethnological information given in an off-hand way which could have been gained only by one who was peculiarly capable of inspiring confidence. Miss Bell has a reverence for the memories of Layard and Rawlinson. She regrets that Britain has to some extent fallen behind in the great work of exploring the buried cities of Mesopotamia, but she, herself, was able, while not engaging in actual excavation, to make many records of the present condition of many monuments and inscriptions. A good map, a full index, and numerous excellent illustrations enhance the value of what should prove one of the best books of travel of the year.

AFRICA.

From Hausaland to Egypt, through the Sudan. By H. Karl W. Kumm, Ph.D. Author of *The Tribes of the Nile Valley*, etc., etc. Illustrated. London: Constable and Co., Ltd. *Price* 16*s. net.*

As a missionary Dr. Kumm is deeply interested in the Christianising of the inhabitants of the Southern Sudan not only as an end in itself, but as a check to the advance of Islam. To read the story of the extraordinarily rapid progress of Mohammedanism from east to west and from north to south in Africa, takes one back to the strenuous days of the immediate successors of the Prophet himself. The "Sinussi" movement, like the Protestant Reformation, has caused a general quickening of religious zeal, and has assumed almost "national" proportions, the chief bond being resistance to European interference. No one can deny the broad truth of Dr. Kumm's assertion that Christianity is better than Islam for the pagan, but it is surely equally obvious that Mohammedanism is better than paganism. And that even Mohammedanism is not incapable of progress is made apparent by the "liberal" outbursts in Turkey and Persia.

Dr. Kumm has made one more new track across the unknown. The sole white man in his expedition, he made his way not by the rifle and the maxim gun but by methods of dignified conciliation. The greatest physical obstacle met with was the Kotto river, which was found much farther north than was hitherto known, and the crossing of which was accomplished at much risk. Curious peoples were met with, such as the beak-faced race whose women enormously enlarge their lips by the use of wooden discs. In the appendix are summaries of the various scientific results, vocabularies, proverbs and sayings, and a very useful list of the traveller's outfit. The book is well printed, and amongst the numerous illustrations are reproductions in colour of the butterflies collected on the way.

Nigeria and its Tin Fields. By Albert F. Calvert. London: Edward Stamford, 1910. *Price* 3*s.* 6*d. net.*

Mr. Calvert is already well known to our readers as an exponent of the mineral resources of Western Australia. In this volume he turns our attention to Nigeria, and gives a useful account of what has been done in the way of developing the tin industry in that country. The industry is still in its infancy, but its potenti-

alities are great, more especially in the Bauchi district. The climate, he alleges is not nearly so unhealthy as has been supposed ; there is an abundant supply of labour ; the government is awakening to the necessity of improving the communications ; and altogether the prospects of the industry are good.

The book contains a detailed notice of the companies now engaged in working tin mines in Northern Nigeria, a copy of the latest regulations on the subject, and over 200 somewhat indifferent photographs.

Egypt as we knew it. By E. L. Butcher. London : Mills and Boon, Limited, 1911. *Price 5s. net.*

In the volume now before us, Mrs. Butcher has given us an interesting series of sketches of life and manners in Egypt both before and after the fall of the Khedive Ismail. She has had unusual experience of Egypt, viz. for more than thirty years, in the course of which she has watched with interest the beneficent revolution which was the result of Lord Cromer's administration ; and, as readers of her other works know, she has made a special study of the history of the Church in Egypt. In this volume, however, we have a number of lightly-drawn sketches on all sorts of miscellaneous subjects, *e.g.* robbers, cholera, domestic occurrences, tramps, and the like, which bring before the reader a vivid and accurate view of some phases of life in the land of the Pharaohs. Mrs. Butcher writes with the ease and assurance of one who is mistress of her subject. Her style is crisp and graphic. Revelling, sometimes, in details, she is never diffuse or wearisome, but holds the attention of her readers from first to last. It is not difficult to discern two causes of her success, viz. her intense sympathy with and affection for the people among whom she lived, and her keen sense of humour, which enabled her to make the best of things. We cordially commend this work to the perusal of our readers, and may add that it is illustrated with a number of photographs.

AMERICA.

Au Brésil, de L'Uruguay au Rio São Francisco. Par Paul Walle. *Prix 8 fr. 50.*

Au Brésil, du Rio São Francisco à l'Amazone. Par Paul Walle. *Prix 10 fr.* Librairie Orientale et Américaine. Paris : E. Guilmoto, Éditeur, 1910.

In the January number of the *Magazine* for this year we reviewed a book by Mr. C. W. Domville-Fife, *The United States of Brazil*, which was avowedly written to "help to arouse in England greater interest than she has hitherto shown in the task that lies before the Brazilian people." We have now before us a somewhat similar work in two volumes by M. Paul Walle, who has been deputed by the Minister of Commerce of France to travel through the various States of Brazil, with the object of studying their economical condition and resources, and examining the commercial methods used by foreigners there. In a prefatory note M. Levasseur, Administrateur du Collège de France, says, "La mission de M. Walle avait une raison d'être économique et pratique. Il devait étudier les ressources du Brésil pour en vulgariser en France la connaissance, et pour éclairer mieux les Français sur les intérêts qu'ils peuvent se créer au Brésil." For this purpose, M. Walle made four journeys to Brazil, in the course of which he visited every one of the twenty-eight States which make up the huge republic, and he has compiled a very interesting and instructive work, and one fairly well calculated to effect the object of his commission. Descriptions of scenery or of people are quite subordinated to considerations of matters economic and

commercial. For picturesque or political Brazil the reader is referred to other works, and even in the two volumes now issued the author has had to condense ruthlessly the materials at his hand upon such important matters as mining, rubber-growing, agricultural produce, and the like. M. Walle confirms what is stated by Mr. Domville-Fife as to the exaggerated accounts of the general insalubrity of the climate of Brazil. This is a very important matter for the consideration of intending emigrants, but France, with a stationary population and a notorious dislike to exile, is not likely to send many to South America. Both the volumes are equipped with maps, and are illustrated with a number of somewhat indifferent photographs. In his valuable preface to the work, M. Levasseur gives us a highly condensed and useful appreciation of the progress Brazil has made of late years in population, railways, exports, imports, etc., and he recommends Brazil to his countrymen as a suitable place for the profitable investment of their capital.

Heaton's Annual: The Commercial Handbook of Canada and Boards of Trade Register. Seventh year. 1911. Edited by Ernest Heaton, B.A., and J. Beverley Robinson. Toronto: Heaton's Agency, 1911. Price $1 or 5*s*.

We have reviewed successive editions of this annual, and can only add to our former remarks the fact that the book is in constant use as a work of reference, and justifies the reliance placed upon it as an admirable source of information in regard to Canada and Canadian affairs. The westward progress of the country is reflected in the addition to the present issue of a number of western towns which have not hitherto appeared, and the volume has been brought up to date in other ways. We cordially recommend it to the notice of all those interested in Canada.

The Incas of Peru. By Sir Clements Markham, K.C.B., etc. With 16 Illustrations and a Map. London: Smith, Elder & Co., 1910. *Price* 10*s*. 6*d*. *net.*

It is a matter for great regret that owing to advancing years Sir Clements Markham considers himself unable to write that history of the early civilisation of Peru for which he possesses unique qualifications. His is a case of life-long acquaintance with the object of his study. Visiting the Pacific Coast as a boy his interest was greatly excited in the romantic tales of the Incas. Returning in early manhood on a mission for the transplanting of cinchona-trees from Peru to India, he was attracted by the pleasing qualities of the natives themselves. Since then, for nearly fifty years, he has continued his studies by means of correspondence with friends in Peru, exhaustive inquiries into ancient manuscripts, collation of authorities, with a thoroughness which has resulted in the accumulation of a vast amount of valuable material. The present volume may be regarded as the cream of his researches. It gives a condensed history of the Inca dynasties, with chapters on the condition of the people, the calendar, festivals, and even Court dresses. An account is given of the Inca language and literature, and in an appendix are a translation of the Inca drama of Ollantay, a sort of Cid, and a specimen of folk-lore. The illustrations are chiefly concerned with art and architecture, while the map includes the original land of the Incas, the basin of Lake Titicaca, and the eastern Montaña. Doubtless, this work will be widely read, not only for its veteran author's sake, but for its own.

POLAR.

The Great White North: the Story of Polar Exploration. By Helen S. Wright. New York: The Macmillan Company, 1910. *Price* 10*s.* 6*d. net.*

The appearance of a number of compilations on arctic exploration is the inevitable result of Admiral Peary's attainment of the North Pole. Some of these are less satisfactory than others, but none of them is reliable or complete. A trustworthy volume on the history of arctic exploration has yet to be written. As far as it goes the book before us seems accurate, but there are many omissions, so many in fact that the volume is not what it aspires to be, a "history of the far north."

Most attention is paid to United States expeditions, as is natural enough in an American work, but surely Cook's story might well have been omitted from a history, and the space utilised for other records. The last page, moreover, is occupied with a eulogy of Peary, as extraordinary in style as it is fulsome in flattery. Among notable omissions we note Mylius Erichsen's splendid work in Greenland, the explorations of the Duke of Orleans, and Mr. Leigh Smith's important work in Franz Josef Land. The *Eira* is not even named. There is no mention of Dr. Bruce's explorations in Spitsbergen, while the Prince of Monaco is briefly mentioned as having "cruised along the coast" of Spitsbergen. The Jackson-Harmsworth expedition is dismissed in a casual reference.

A brief glossary of terms cannot escape serious criticism when a fjord is defined as "an abrupt opening in the coastline, admitting the sea," a glacier explained as "a mass of ice derived from the atmosphere," and an iceberg described as "a large mass of solid ice, generally of great height, breadth, and thickness." The explanations of ice-foot and land-ice also need revision. On p. 268 *Greenland* should be *Grönland*, and on p. 430 the name of the *Belgica* is wrongly spelt: the Americanisation of Stor Fjord by the addition of a terminal "e" cannot be allowed. But these are minor points, and so also is the spelling of Spitsbergen with a "z."

On the other hand we notice a good account of Dr. John Rae's remarkable sledge journey of 1846-47, and we are glad to see that justice is done to his share in the discovery of the fate of Franklin.

The volume is written in a popular vein, and, no doubt, is intended to appeal to the general reader, but that is all the stronger a reason that it should be complete and trustworthy. However, no volume of this kind can be of value unless written by a competent authority, who can estimate the value of any expedition's work apart from the popular plaudits it receives.

The price of the book seems excessive.

Bei den Eskimos in Westgrönland. Ergebnisse einer Sommerreise im Jahre 1906. Von Dr. Rudolph Trebitsch. Berlin: Dietrich Reimer, 1910. *Price* 8 *marks.*

Dr. Trebitsch here relates his personal impressions and experiences during his two and a half months' stay in Greenland, in the summer of 1906, but the most valuable part of the record is the ethnological appendix, pages 138-162. The author had made a summer trip to Iceland, and a steward on board, who had been in Greenland, so whetted his desire to see the Eskimos at home, that he applied to the Danish authorities for leave to visit the country. He was informed that no one was allowed to travel there on pleasure bent, and that the Danish Government granted leave to scientific expeditions only. The doctor returned to Vienna, and applied to the Imperial Academy of Science for their commission to secure for them phonographic records of the Eskimo language! Armed with this document

he made further application, but (perhaps the authorities understood the situation) was only accorded leave to spend a few weeks in a strictly limited district.

The book contains nothing whatever of philological interest—not even one specimen of phonographic record is reproduced, phonetically or otherwise. The so-called folk-songs and nursery rhymes of the Eskimos are given in German translation, but the selection even of these seems unhappy.

For the rest, the author describes in great detail his outfit and his travels. His photographs of the land and sea-scapes are very beautiful, but the accompanying letterpress is not of a kind to be of general interest.

The ethnological collection made by the author is described (and well described) by Dr. M. Haberlandt of the Vienna Natural History Museum. It is very extensive. There are one hundred and forty-five specimens of stone implements; forty-five specimens found in graves and ruined houses; a special collection of two hundred and twenty specimens from West Greenland, and forty-seven specimens from East Greenland. The whole collection has been gifted by the finder to the Natural History Museum in Vienna, and has been carefully arranged by Dr. Haberlandt.

GENERAL.

Stray Leaves on Travel, Sport, Animals and Kindred Subjects. By James Conway Walter. London: Kegan Paul, Trench, Trübner and Co., Ltd., 1910. *Price* 5*s. net.*

There seems to be no end to the supply of books of personal "reminiscences and recollections." The volume now before us is one of this class and will serve admirably to entertain the reader on an idle day. The author can scarcely be said to have compiled it on any definite plan, unless we suppose that the chapters are, in the first instance, assigned to a particular locality. For example, in the chapter headed "Walks in Great Britain" we have an account of a walk taken by the author from Cambridge to London and back in 1852, on the occasion of the funeral of the Duke of Wellington, after which he proceeds to describe another walk from London to Brighton, in 1863, on the arrival in this country of the Queen-Mother Alexandra; from 1863 he jumps to 1887, *i.e.*, to the riots in Hyde Park, and so on. In passing, we may remark that we believe we do Mr. Walter no injustice if we say that his book indicates he is somewhat proud of his early feats in pedestrianism, an accomplishment he inherited from his father. In the course of his long life, Mr. Walter has travelled in Egypt, Palestine, France, Switzerland and Italy, besides enjoying a fair amount of sport in the way of shooting and fishing at home, of which he gives us a very remarkable account. But it has to be confessed that as tales of travel and sport are now told, his accounts are somewhat tame and commonplace.

Physical Geography for Schools. By Bernard Smith, M.A., F.G.S. London: A. and C. Black, 1911. *Price* 3*s.* 6*d.*

The author states in his preface that this book has been written for the use of students in the higher classes of schools, but that the requirements of both teachers and pupils have been kept in view. He disclaims all claim to originality of treatment, so that any critical notice must necessarily confine itself to the methods of presentation, and the range of subjects selected. The discussion of so vast and relatively so ill-defined a subject as physical geography, within the limits of space imposed by the style and price of the book, gives rise to considerable difficulty.

Perhaps naturally, in view of the large amount of work which has been done recently upon the physical processes observable at the surface of the globe, most space has been devoted to this aspect of the subject. The chapters dealing with it are illustrated by a really admirable series of photographs, most of which have been well reproduced, and are adequately explained. The text of these chapters is also excellent and well up to date, even so recent a paper as Professor Garwood's "Features of Alpine Scenery due to Glacial Protection" which appeared in the *Geographical Journal* for September last, being noted in an appendix. Less estimable in our opinion are the two chapters which form Part I., entitled "The Earth and its Parts." The author states that this part has been shortened to allow more space for other parts of the subject, but we think that the shortening has been carried too far, and has thus rendered sections almost unintelligible. Thus the very difficult subject of the seasons is dismissed in two short paragraphs. Curiously enough, in the same chapter the nebular theory has more than a page devoted to it. In view of the fact that in the temperate regions of the globe all man's activities are punctuated by the seasons, this seems to us a very marked disproportion. Mr. Smith might also, we think, have followed Professor Salisbury in beginning his book with a consideration of the surface features of the earth, rather than with an account of the solar system.

A First Book of Physical Geography. By W. Maclean Carey, M.A., B.Sc. London: Macmillan and Co., Ltd., 1910. *Price* 1*s.* 6*d.*

A comparison of this little book with Mr. Bernard Smith's work reviewed above, shows how much ambiguity is involved in the use of the term Physical Geography. A great part of the present book is taken up with elementary physics, meteorology receives somewhat extended treatment, and elementary mathematical geography occupies considerable space. The sculpture of the earth, the subject to which Mr. Smith devotes quite one-third of his book, is here dismissed in one short chapter, and in this chapter the treatment of ice follows quite old-fashioned lines, and modern work on such phenomena as river capture, etc., is ignored. No mention is made of topographic maps. The book is especially intended for use in preparing for certain examinations, and contains many typical examination questions. The subjects discussed are treated of in a clear and simple fashion, but the general scheme seems to us to lead to the omission or scanty treatment of the most interesting parts of physical geography.

BOOKS RECEIVED.

The Rhine, including the Black Forest and the Vosges: Handbook for Travellers. By Karl Baedeker. With 69 Maps and 59 Plans. Seventeenth Revised Edition. Cr. 8vo. Pp. xxxiv + 554. *Price* 8*s. net.* Leipzig: Karl Baedeker, 1911.

Florence Past and Present. By the Rev. J. Wood Brown, M.A. With Maps and Illustrations. Cr. 8vo. Pp. xxiv + 434. *Price* 6*s.* London: Rivingtons, 1911.

A Saga of the "Sunbeam." By Horace G. Hutchinson. With Photogravure Portrait and 12 Illustrations from Photographs. Demy 8vo. Pp. xviii + 211. *Price* 6*s.* 6*d. net.* London: Longmans, Green and Co., 1911.

Siren Land. By Norman Douglas. Cr. 8vo. Pp. viii + 302. *Price* 6*s. net.* London: J. M. Dent and Sons, Ltd. 1911.

Cities of Southern Italy. By Augustus J. C. Hare. Edited by St. Clair Baddeley. Illustrated. Cr. 8vo. Pp. xxxi + 237. *Price* 5*s. net.* London: William Heinemann, 1911.

Brazil. By Pierre Denis. Translated, and with a Historical Chapter by Bernard Miall and a Supplementary Chapter by Dawson A. Vindin. With a Map and 36 Illustrations. Demy 8vo. Pp. 388. *Price* 10*s.* 6*d. net.* London: T. Fisher Unwin, 1911.

Who's Who? 1911. Cr. 8vo. Pp. xxvi + 2245. *Price* 10*s. net.* London: A. and C. Black, 1911.

Finland To-Day. By George Renwick, F.R.G.S. With 44 Illustrations and a Map. Demy 8vo. Pp. xii + 348. *Price* 10*s.* 6*d. net.* London: T. Fisher Unwin, 1911.

The British Isles, Geographical Diagrams and Land Forms, with Questions, Statistics, and Tables. By H. J. Snape, M.A., containing 56 Illustrations from Photographs. Cr. 4to. Pp. 64. *Price* 1*s.* 6*d.* London: Adam and Charles Black, 1911.

Handbuch der Ozeanographie. Von Dr. Otto Krümmel. Band ii. Die Bewegungsformen des Meeres. Mit 182 Abbildungen im Text. Demy 8vo. Pp. xvi + 766. Preis 32 M. Stuttgart: J. Engelhorn's Nachfolge, 1911.

Europe (Blackie's Causal Geographies Regionally treated). By H. J. Snape, M.A. Cr. 8vo. Pp. x + 190. *Price* 2*s.* London: Blackie and Son, Ltd., 1911.

Structural and Field Geology for Students of Pure and Applied Science. By James Geikie, LL.D., D.C.L., F.R.S., etc. Second Edition Revised. Demy 8vo. Pp. xx + 443. *Price* 12*s.* 6*d. net.* Edinburgh: Oliver and Boyd, 1908. [*Presented by the Author.*

Geographical Essays. By Wm. Morris Davis. Edited by Douglas Wilson Johnston. Cr. 8vo. Pp. vi + 777. *Price* 12*s.* 6*d. net.* Boston: Ginn and Co., 1911.

An Englishman in Ireland: Impressions of a Journey in a Canoe by River, Lough and Canal. By R. A. Scott-James. With a Map and 9 Illustrations from Photographs by the Author. Cr. 8vo. Pp. viii + 264. *Price* 5*s. net.* London: J. M. Dent and Sons, Ltd., 1911.

An Eastern Voyage: A Journal of Travels through the British Empire in the East and South, and Japan. By Count Fritz von Hochberg. In two Volumes. Fifty coloured and 96 black and white Illustrations. Sq. med. 8vo. Vol. i.: pp. viii + 351; vol. ii.: pp. viii + 319. *Price* 31*s.* 6*d. net.* London: J. M. Dent and Sons, Ltd., 1910.

Library of Congress. Report of the Librarian of Congress and Report of the Superintendent of the Library Building and Grounds for the Fiscal Year ending June 30, 1910. Washington: 1910.

General Report on the Operations of the Survey of India administered under the Government of India during 1908-9. Prepared under the direction of Colonel F. B. Longe, R.E., A.D.C. Calcutta: 1910.

Annual Statement of the Trade of the United Kingdom with Foreign Countries and British Possessions, 1909. Supplement to volumes i. and ii. London: 1911.

Colonial Reports (Annual).—Report for St. Lucia, 1909 (672).

Publishers forwarding books for review will greatly oblige by marking the price *in clear figures, especially in the case of foreign books.*

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

FROM HAUSALAND TO EGYPT.[1]

By Dr. Karl W. Kumm.

(With Illustrations and Sketch-Map.)

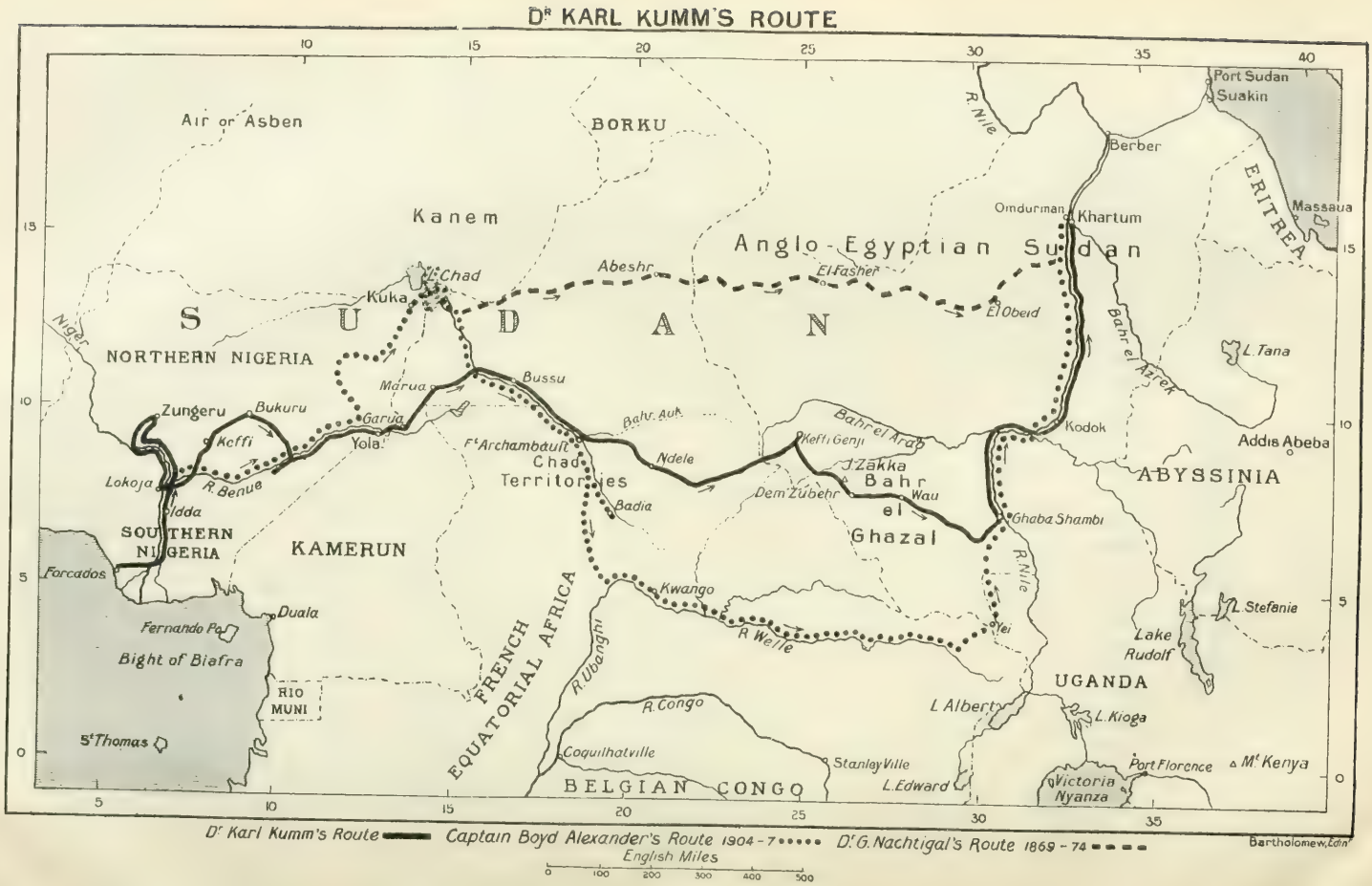
Africa has been called the Dark Continent. It may with equal right be called the Continent of Sunshine. Geographically, little of it has now been left in darkness.

The heart of Africa is the Sudan, a country lying south of the Sahara; the word "Sudan," being taken from the Arabic Soud, Sauvad, dark, black, means the land of the blacks, or as some have translated it, the land of darkness.

The Western Sudan and Timbuctu were known 100 years ago. The Niger territories, with Hausaland, were penetrated in the third and fifth decade of the last century. Sir Samuel Baker and Dr. Schweinfurth laid bare the unknown reaches of the Upper Nile; but between the Central Sudan, the Lake Chad region, and the Nile Valley between the Shari and the Bahr-el-Ghazal, some 50,000 square miles had, up to 1870, remained untouched—a happy hunting-ground for slave raiders, a somewhat inaccessible plateau region, situated in the very centre of Africa.

In 1869 Dr. Nachtigal—who is without doubt one of, if not the most fruitful of African explorers, whose documents form to-day the basis of any botanical, zoological, geological, or physiological publications on the provinces of the Central Sudan—had crossed the Sahara, had visited Borku, had wandered round Lake Chad, had seen the lands of the middle Shari, and from Kuka (the capital of Bornu) had essayed to penetrate Bagirmi and Wadai, where both Vogel and Beurman had been killed some years before, and to go through Darfur and Kordofan to Khartum. In this he succeeded. With a wonderful amount of tenacity he advanced in his careful and cautious way, made friends as he went, left no enemies

[1] A lecture delivered to the Society in Edinburgh on Jan. 25, 1911.


Dr KARL KUMM'S ROUTE
Air or Asben
BORKU
Kanem
Anglo-Egyptian Sudan
Port Sudan
Suakin
Berber
R. Nile
Omdurman
Khartum
Massaua
ERITREA
L. Chad
Abeshr
El Fasher
El Obeid
Kuka
S U D A N
NORTHERN NIGERIA
Niger
Bahr el Azrek
L. Tana
Marua
Bussu
Zungeru
Bukuru
Garua
Bahr Auk
Bahr el Arab
Kodok
Addis Abeba
Kaffi
Yola
Fort Archambault
Keffi Genji
J. Zakka
Ndele
Chad Territories
Lokoja
R. Benue
Dem Zubehr
Bahr el Ghazal
Wau
ABYSSINIA
Idda
SOUTHERN NIGERIA
KAMERUN
Badia
Ghaba Shambi
Forcados
Kwango
R. Nile
L. Stefanie
Duala
Fernando Po
Bight of Biafra
R. Welle
Lake Rudolf
FRENCH EQUATORIAL AFRICA
R. Ubanghi
UGANDA
RIO MUNI
R. Congo
L. Albert
L. Kioga
St Thomas
Coquilhatville
Stanley Ville
Port Florence
Mt Kenya
BELGIAN CONGO
L. Edward
Victoria Nyanza
Dr Karl Kumm's Route
Captain Boyd Alexander's Route 1904-7
Dr G. Nachtigal's Route 1869-74
English Miles
0 100 200 300 400 500
Bartholomew, Edin.

behind, and thus slowly passed from land to land until he reached the Nile Valley.

Nachtigal has left for ever his footprints on Africa, not only in crossing the Sahara, exploring Borku, and traversing the Sudan, but in giving to Germany her African Colonies. He it was who hoisted the German flag in the Kameruns and German South-West Africa.

As one follows Nachtigal's route from the Central Sudan to the east, one notices that he aimed at the great Moslem towns of the north, being handed from Moslem chief to Moslem chief as a Christian traveller. He never disguised himself as a Moslem, and his straightforwardness and fearlessness gave him considerable prestige with the Moslem chiefs.

Thirty-five years later—in 1904—Captain Boyd Alexander, accompanied by his brother, by Captain Gosling and Mr. Talbot, besides a Portuguese taxidermist, added largely to our knowledge of the Central Sudan, surveyed Lake Chad, and following the Shari to its headwaters, crossed, by way of the Welle, to the Nile. This journey skirted more or less the southern border of the Sudan, through savage, cannibal, pagan tribes.

The sufferings to which the expedition was exposed were exceptionally trying. Captain Claud Alexander (Boyd Alexander's brother) was buried at Maifoni, in Northern Nigeria, and Captain Gosling died at Niangara on the Welle. Mr. Talbot had returned from Lake Chad by way of the Niger, and only Captain Boyd Alexander, accompanied by his Portuguese collector, succeeded in reaching the Nile. The work done by them, especially in Northern Nigeria and round Lake Chad, was of the greatest importance. Later on, the climatic and health conditions were such as only strong will-power backed by an exceptionally wiry constitution managed to overcome.

In 1909, Captain Boyd Alexander again went to the Sudan, travelled through the German Kameruns and Adamawa, intending to follow Dr. Nachtigal's route through the Mohammedan States of the North Central Sudan, and perhaps attempt to make his way through Borku, Tibesti, and Kufra to Bengazi on the Mediterranean. But the hungry Sudan has taken the bold Captain's life. He was killed a few months ago at Nyeri, north-east of Abesher, the capital of Wadai. And now he lies buried with his brother at Maifoni, as Captain Gosling lies at Niangara.

"The muffled drum's sad roll has beat
The soldier's last tattoo;
No more on life's parade shall meet
That brave but fallen few;
On fame's eternal camping ground
Their silent tents are spread,
And glory guards with solemn round
The bivouac of the dead."

The two routes through the north and the south of the Central Sudan, opened by Nachtigal and Boyd Alexander, have since been covered, the former in 1881 by two Italians—Dr. Pelegrino Matteucci and Lieut. A. Maosari—and the latter by Mr. Savage Landor in 1906. Between the

two routes, which are some 600 miles apart, there lay a considerable stretch of unexplored territory, and it was this region which it has been my privilege to traverse.

On the 10th of October, 1908, I left Liverpool, accompanied by seven missionaries of the Sudan United Mission, including the Superintendent, a medical man, an engineer, and also my personal servant, Tom; visited the Governor of Northern Nigeria to arrange with him about the establishment of the Lucy Memorial Freed Slaves' Home, called at the ten Mission Stations of the Sudan United Mission, and then decided to attempt a traverse of Africa, following, roughly speaking, the borderline between Mohammedanism and paganism. Careful preparations had been made for the journey at home. From London, Paris, and Berlin the Government officials in Central Africa had been requested to assist me, and this they did in a most friendly manner.

Three specialities of outfit which I made use of in Central Africa I desire to recommend. These are:—a waterproof poncho, which is an overcoat, tent, and ground-sheet in one; several of the best camel-hair rugs, which are warm when dry and warmer still when wet, and this in the mountain regions of Central Africa, especially in the rainy season, is a most important matter: strong, long-shafted, white sealskin boots, with four soles and a few nails, are as light as they are durable, and are excellent for riding and tramping through the bush. I must have marched something over three thousand miles in one pair, and only the fourth sole was gone.

Certain other things which I did not find a success include dried milk, which would not mix after six months in the tropics. The American wooden army saddle (cowboy) gives the African barb a sore back. Pith helmets are a nuisance. They get squashed when packed, and become pulp when wet. If anybody could invent a suitable sunproof headgear, the blessing of all white Central Africans would be his sure reward.

The French Government *Tonnelet*, made of corrugated iron, water- and air-tight, and easily opened, is the most useful packing case I know of for Central Africa. X furniture is too weak for tours that extend over a year or more, but is to-day practically the only thing at our disposal, as bed, chair, table, bath, washstand and stool, all go into one *soi-disant* waterproof bag.

The tent should be large enough to hold, besides the bed and boxes, a table and chair, so that the traveller can have his meals inside if it rains. A tent ten feet by eight, with a double roof, should have an outer sheet projecting all round, and thus give protection to the loads stored under it.

Two collapsible Canadian canoes weighing twenty pounds each, with four paddles, would take away all the terrors of swollen rivers, as they might be tied together to form a stable raft.

Books are a great boon in Central Africa. The monotony of a daily march or ride of from six to eight hours becomes unbearable if the mind is allowed to wander. The lack of regular reading is the cause of much of the mental trouble of the white man in the tropics. Quite a number of travellers, Government men, and missionaries, have gone out of their

minds through brooding over their own thoughts. They usually begin with misunderstandings, then come misrepresentations, and at last the cockatrice's egg is hatched out into lunacy.

Besides outfit, the acquisition of certain virtues is most desirable. When lecturing a few years ago before the National Geographical Society of the United States in Washington, the lanternist broke down with his apparatus, thus providing an illustration for the statement I preferred to the audience, that the *three* virtues indispensable for an African traveller were "Patience, Geduld, and la Patience," and that President Roosevelt's axiom, "Speak softly, carry a big stick, and you will 'go far,'" was more applicable to America than Africa.

Slowly the yellow flood surged westward, as we said goodbye to our friends at Dempar on February 16th, and commenced our trans-African

Cooking food for the boatmen on the banks of the Benué.

journey in earnest, going up the Benué, and thence by way of the Shari, to reach, in God's own time, the Nile. My five headmen had said farewell to their wives, who in vain tried to hide their tears, and the missionaries waved their Godspeed, as our eight polers drove the steel boat slowly up the current. Our barge, being covered by a heavy sun-roof and awning, was top-heavy and required careful handling. The tornadoes that sweep down the Benué valley at this time of the year have brought disaster to many canoes and barges before. We therefore took good care to hide behind high banks whenever the sky became clouded over.

I had carefully chosen seven of my best men to accompany me, and intended to use these as personal servants and as headmen. Their names were :—

1. Isa (Jesus), who, while small in stature, was a powerful headman, a magnificent wrestler, a man of considerable will-power, and exceptionally intelligent for an African.
2. Giwa (the elephant), a tall, broad-shouldered, bull-necked Hausa, who, at a pinch, could take four men's loads on his head.
3. Audu-Abuja (commonly known as "Dorina," the hippopotamus), who was as much at home in the water as on land. I know not how many times he swam across the Kotto River.

4. Bigila (the bugler), a very strong and willing man, but a thief, suffering from kleptomania. He had to be punished once or twice on the road. As long as there was nothing to steal he was one of the most useful men I ever had.
5 Musa (Moses). He was the oldest man and was a very good taxidermist, having prepared quite a number of heads and skins for me.

Besides these five headmen, I took Danagana, my cook, steward, and general factotum. To say that he was faithful, trustworthy, and intelligent for an African is to say very little. He was far more than that. I could trust him with important messages to native chiefs, and he would unostentatiously secure their respect for himself and the caravan. I sent him from Fort Archambault to Milfi in Bagirmi, some eight days' journey, to purchase 25 pack-oxen and several horses, and he executed his commission in a speedy and very creditable way. He was a good shot, and I took him with me repeatedly when hunting dangerous game. If anything was stolen he was the man to ferret out the thief in no time. He could beat everybody in wrestling except the headman; was a good rider, and a splendid cook, whose pancakes and *mayonnaise* one remembers even here in Europe.

And last, but by no means least of my seven stalwarts, was Peter, the small boy, but latterly the big boy, whose smiling, ugly face and cheerful sing-song as we travelled along the road, with occasional pokes of fun at the carriers who lagged behind, was as useful as it was cheerful.

Having this set of men to fall back upon, it is easily understood that many difficulties vanished that might otherwise have interrupted my journey or brought it to an untimely end.

Two districts which were of special interest to me were the Djen district and the M'bula district. At both of these places the pagan population is massed together, and especially in the M'bula district the villages on the bank followed one another without any open space between for five or six miles. The river was alive with water-fowl, ducks and geese, teal and snipe, cranes and crown-birds, pelicans and burun-tunki, a bird that looks as strange as its name, for it is black and white, much taller than a stork, and has a heavy beak. It walks in a most solemn, stately style, in lonely grandeur on the sandbanks or the fish-abounding shallows, having no communion with any other birds. American missionaries named these birds in my hearing, "Close Communion Baptists!"

Hardly ever have I tasted such delicious duck, teal, and goose as on the Upper Benué. Two or three antelopes also found their way into our larder, and pleased our boatmen not a little.

Our lazy, languid progress on the water was an excellent tonic, and reminded one of the sleepy movement of a drifting Nile dahabiah. The frequent calls from other boats as we passed them, *Sanu, sanu* (Slowly, slowly), sounded like irony. *Sanu, sanu* is the Hausa salutation, and illustrates the mode of progress of Central Africa, which is very *sanu, sanu.*

On Saturday, March 13, we arrived at Yola. The reception afforded to me by the representatives of the Government there, as well as by the

officials of the Niger Company, was of the friendliest. The Resident of the Yola Province expressed his sincerest hope that I might not be eaten by cannibals, especially as I did not intend to take an armed escort with me.

On Monday afternoon, March 15, Mr. Hosking and I attempted to penetrate further up the Benué, and get, if possible, to Garua. But after spending the better part of Tuesday morning in pulling the boat over sand-banks, and digging out channels for it, we found it an impossible task, and I therefore decided to run back to Yola in the afternoon, engage carriers, and begin my overland march. With the assistance of the Niger Company some 55 carriers were engaged, and an exceptionally strong horse secured, which I thought would have carried me right across Africa; but we had to bury it at Fort Archambault.

Two other horses which I had ridden through Northern Nigeria I had left behind in the Muri Province, and on Wednesday, March 17, at 6.30 A.M., my caravan started from the north bank of the Benué, opposite Yola, into the hills of Adamawa.

A clear, bright, sunny morning augured success for the expedition; the carriers went at a half-trot; the horse I rode was in excellent condition. My heart went out in gratitude to God for being allowed to make so favourable a start, remembering how, fifty years ago, Dr. Barth (the first white man to visit Yola) had crept out of the town sick in body and sick at heart, driven from the gates by the order of the Sultan; and as I thought of the difficulties Mizon, Von Vechtritz, Passarge, and the early representatives of the Niger Company had encountered at Yola, could not but be gratified with the wonderful change which had been effected.

Our first day's march was a short one of twelve miles. Certain loads had to be rearranged, and the men got into the way of marching together. I had fifty-five carriers divided into sections of ten, each under a kind of sub-headman. With the headman, Dangana, Peter, and one or two women belonging to the carriers, my caravan amounted to seventy souls.

At midday on the third day after leaving Yola, I crossed the frontier and entered German territory. A native clerk, who acts as Customs official, reminded me of the crisp militarism of the Fatherland. He was very respectful, spoke English, German, and Fulatanchi, provided us with good housing and good native food, and was generally useful. Two days later I entered Garua, the government centre of German Adamawa. Both the captain in command and the lieutenant were absent on patrol, and the medical man acted as Resident. He, with a secretary to the Administration and two non-commissioned officers, occupied the fort. A hundred native soldiers act as garrison; they are drilled after the German fashion, but in pidgin-English. I was told that my German friends do not desire their "boys" to know German, so that these may be unable to follow their conversation. The only word I found well-known amongst the boys at Garua was "Jawohl," a glorified "yes." To hear this word flung at you at the end of a conversation in pidgin-English, in the most military German fashion, is at first somewhat startling.

There are roads ten yards wide from Garua to the coast (600 miles), and to the Logone (250 miles), well graded roads with bridges across the smaller rivers, and "drifts" through the larger ones. A waggon traffic has been commenced on these roads, and there is no reason why motor cars should not be run on them, from the Guinea Coast almost to Lake Chad.

There is a Government school, a hospital, and a dispensary at Garua, all free for the natives. These are very good and useful paternal institutions. The school, primarily a Freed Slaves' Home, is supported, wonderful to relate, by the Mohammedan Fulani Chiefs (the Lamidoes). In one point the German Government of Adamawa is making a mistake. That is in the general employment of forced labour. There are hundreds of natives, who get neither pay nor rations, employed in strengthening the fort at Garua, and there are thousands of natives working on the roads. All these labourers are slaves sent by the various chiefs to work off the taxes the tribes should pay. The half-starved skin-and-bone bodies of these workmen are a lamentable sight. The roads running through the country are splendid, but the forced labour employed in making them has depopulated both sides of them. The people have run away into the bush. For five successive days on the road from Garua to Marua I counted a dozen villages in ruins. This is not good policy.

After traversing the Fulani country in Adamawa I entered the land of the Musgun pagans. The houses of this tribe are curious fortlike structures: a compound consists of five or six round huts built close together, usually in a circle, the huts being connected, but only the first and last have a door into the open. These latter are usually the largest, and their conically-shaped surfaces are covered with regular protuberances used as ladders in the construction of the building. Some of them are twenty feet in height. Both walls and roofs are made of mud. The Musgun country is absolutely flat.

The natives draw their water at this time of the year out of wells, some of them thirty feet or more in depth.

On April the 10th, we saw Musgun hamlets on both sides of our line of march, the most prominent places being the village of Muga: the largest town of the Musgun—Ngilming—consists of a great number of splendid mud giddas (compounds). At this place the ground became swampy. A number of cob antelope were disporting themselves in the open plain. A breeze began to blow from the south and the sky became overcast. It was an excellent day for marching, as a few drops of rain had cooled the atmosphere.

At midday we reached the banks of the Logone opposite the town of Musgun. The chief came across to meet us, and we forded the western branch to an island. The depth of the water was 2½ feet and the width 150 yards. The other branch of the Logone was much deeper, though its width was about the same as the western branch. A number of small dug-outs, each carrying one man and one load, soon ferried us across, and at 2.30 we reached the well-built (but now ruined) former Government station. Musgun is a walled town of

about 500 people. Fifteen miles south of Logone is the village of Pis on the eastern bank, and fifteen miles south-west of that, the village of Vullum. Gowei, another large Musgun village, is about sixty miles south-west of Musgun. North of Ngilming lies Gamjem, and between Pis and Vullum are the three small villages of Mariafi, Tegele, and Vaje.

The Musgun men are magnificent specimens of humanity, but the women are exceedingly ugly. Their upper and lower lips are pierced and have discs of tin, looking-glasses, or Maria Theresa dollars inserted in them. I rested at this place on Sunday, April 11th, and as the nearest Musgun village through which we would have to pass—Morno—

A hand-plough.

was a considerable distance away, I decided to use a part of the night for our march. We left Musgun, therefore, on Monday morning at 2.30 A.M., and travelled for two hours north-east through bushless prairie till 4.45 A.M., when we rested for half-an-hour by the side of a large pool, inhabited in the rainy season by hippos. A small jungle growing on the west bank of this pool looked very gloomy, as clouds had covered the moon. We continued our journey at 5.15 A.M., and when it dawned we came upon a herd of Senegambian harte-beest. I shot a young buck, the colouring of whose skin was very light.

At half-past seven the country changed from prairie to park land, but was absolutely flat. Here and there swampy pools remained as remnants of the floods of the last rainy season. At midday we reached Morno, after having crossed the dry bed of a small river running north-

east. Morno is a poor place. The huts are built of mud and grass, without any architectural pretensions, and are scattered about through the bush. A number of people from Maniling, who had heard of our arrival, came out in the afternoon to visit us.

Two hours' marching the next morning saw us at the latter place, where a German sergeant had drawn up his little body of police for our reception. The path that morning lay through a forest of deleb palm with a good deal of water covering the ground. The sergeant told me that in the rainy season the path I had come by would be covered by two or three feet of water, and as this breeds mosquitoes and disease, nothing much can be done with the land.

Maniling Station looks tidy and clean, but seems a very poor sort of a place, hidden away, as it is, in the bush surrounded by swamps. It was here that I said good-bye to German territory, and looking forward to unexplored regions ahead, hoped for as successful a march through the French sphere as that through German Adamawa had proved itself to be.

Comparisons are odious, but in passing through territories administered by British, German, and French officials, one could not but notice the differences of administration.

In this all three agree, though the British and German administrators lay perhaps more emphasis upon it than the French, namely, that the autocratic form of government is the most suitable for primitive races. Forced labour has been largely abolished in the British and French spheres, but is recognised and employed freely in German Adamawa. The payments made to natives are high in the British territory, lower in German, and lowest in the French regions. In roads and river connections the Germans far excel; then come the British, and lastly the French. The French are most anxious to retain the pagans as pagans, and not let them become Mohammedan. As a consequence the pagans in the Shari-Chad Protectorate have the greatest confidence in their white administrators. This is not so in German Adamawa, nor in Northern Nigeria, where the intelligent and half-civilised Moslem has secured considerable prestige, and is in many cases preferred by the Government official to the naked bush pagan. As a consequence the French have had more trouble with the Moslems, and the Germans and British more trouble with the pagans in their respective territories.

English coinage is now commonly used in Nigeria, and Egyptian coinage in the Anglo-Egyptian Sudan; while in Adamawa and the Shari-Chad Protectorate the Maria Theresa dollar is still the favourite coin of the native trader.

The conquest of the Central Sudan by the French, the importance of which has not been realised in Great Britain, looks, as one reads it, hardly real. In 1898 a French expedition, under Captain Bretonet, accompanied by several white men and a number of Senegalese tirailleurs, had gone down the Shari River to explore these new territories and take possession of them in the name of France. Rabba, who had heard of this expedition, sent an army to meet it, and in the Nilim Hills the little French force was surrounded by thousands of fanatical Mohammedan

savages and cut up. Only one or two men escaped. This was a serious blow to French prestige, and it was therefore decided in Paris to punish Rabba.

In the autumn of 1898 three French expeditions were sent into the Central Sudan, the first starting from Algiers in the North across the Sahara. For over a year Captain Foureau, who led this party, was not heard of, but he succeeded in crossing the great desert and reached the shores of Lake Chad.

The second expedition, under Gentil, started from the mouth of the Congo, and going by way of the French Congo, the Ubangi and Shari, fought its way through overwhelming obstacles down towards Lake Chad.

The third expedition, which, under Voulet and Chanoine, had left St. Louis on the Senegal about the same time, pursued its way through Timbuctu and Zinder towards Lake Chad. The story of this third expedition is one of wild dreams, deplorable excess, and disaster. The two leaders seem to have gone out of their minds. When the doings of this expedition were reported home, a superior officer was dispatched to take charge, but on his arrival he was foully murdered by Voulet and Chanoine, who ordered their troops to fire on the approaching superior. For some time massacres, rapine and outrages were of a daily occurrence, until the tirailleurs, satiated with vice, turned their rifles upon their miserable leaders and shot them. The remnants of this third party, under Joalland and Meynier, at last reached the neighbourhood of Lake Chad. Gentil had been attacked by Rabba, a very serious encounter had ensued, in which the small French force was compelled to retreat. Their weakened number seemed incapable of offering effectual resistance to the well-armed multitude of Rabba, and it looked as though Gentil's expedition would follow in the wake of Bretonet, and be annihilated, when suddenly, as it seemed out of nowhere, appeared Foureau from Algiers and Joalland and Meynier from the Senegal. They caught Rabba at Kusseri, defeated him, took Dikoa, his capital, liberated between 200,000 and 300,000 slaves there, followed Rabba's son, who had escaped into Northern Nigeria, and slew him, and established peace in the lands of that now fallen Napoleon of the Central Sudan. This was the beginning of the French Shari-Chad Protectorate.

History is rapidly being made in Central Africa to-day. Colonel Moll, the Governor of the Shari-Chad Protectorate, has had to face the Sultan of Wadai, who had concentrated his forces in Massalit. The Colonel was attacked by some five thousand well-armed tribesmen, and while no detailed information is as yet at our disposal, a dispatch has reached Paris that Colonel Moll and about a quarter of his diminutive army has fallen. Action is being taken by the French Government to dispatch a considerable expeditionary force to maintain the white man's authority in the Shari-Chad Protectorate.

As long as Islam is what it is, a Mohammedan fanatical outbreak may be expected at any time, and as these territories are very far removed from Europe, to cope with such an outbreak adequately would be exceedingly difficult.

On traversing the Shari-Chad Protectorate through largely unexplored regions, my caravan grew to about 250 people, including my own carriers and servants, Lieutenant Raymond with twenty guards and thirty carriers, fifty of Sinussi's men led by an old chief, some of them going two days' ahead of the caravan to prepare camps, and a caravan of some fifty or sixty Mecca pilgrims. These latter had come from Northern Nigeria, had travelled round the north end of Lake Chad, had ascended the Shari, and on getting to the end of their resources, had appealed to me to secure my permission to follow in our wake on our way to the Nile. There was war in the northern Mohammedan Sultanates that had made it impossible for them to follow the old Mecca pilgrim caravan route, and there was no open road through the pagan regions of the south. I hesitated to agree to their request, as there were women and

A curious agricultural implement of the Kirdi (Sara-Kabba).

children in this caravan; but as they were fellow-subjects of ours and in traversing French territory asked for our help, in spite of considerable misgivings I gave them permission to follow us into the unexplored.

The fauna of the French Shari-Chad Protectorate is comparatively little known, and an expedition into this country would richly repay a student of zoology. Not only are some of the animals of those regions curious, but the native tribes whose lands we traversed were remarkable in appearance and in their habits.

The women of the Sara-Kabba tribe carried in their lips wooden discs. The disc in the upper lip was three inches in diameter, and that in the lower six inches.

The Sara-Kabba are the original inhabitants of the Shari Valley. They must have formed at one time one of the larger nations of Africa, for after centuries of being harassed by Moslem slave-raiders, and after the wars of half a millennium, there are still a million or two left of them.

The Fulanis of Adamawa built the Hanyan Yaki (war road) into

their land. The Bagirmi people used to have a regular hunting season, when the warriors of that Moslem kingdom used to invade the Sara-Kabba country, as the English invade the Scottish Highlands in August, only that in this case the hunted were not grouse and deer, but human beings.

In the latter days Sinussi has played havoc with a number of their eastern districts.

One of the Sara-Kabba chiefs, when I inquired from him the reason why they disfigured their women, informed me that their forefathers had developed this habit in order that their women might exercise no attraction for the Moslem slave-raiders.

The Sara-Kabba have withdrawn themselves from the roads and the Shari river, and most of their villages are hidden away in the swamps and on the banks of the Aukadebbe. They are as shy as—nay, they are very much more shy than—the game in the bush.

When coming suddenly upon one of their villages one day I heard shrieks, a rush, a rustling in the grass, and there was silence: the population of the village had decamped.

I made myself at home, but informed my carriers and followers that they would "sha wohalla dayawa" (drink plenty of trouble) if they touched any of the things belonging to the natives; and with the exception of a water-pot or two that was broken, no harm was done.

The next morning we continued our march. I dispatched the caravan with a guide in front and only held back two carriers, one with a bale of cloth, another with a box of beads. The loads were opened, I tore off a piece of blue cloth of some 20 yards, put a few handfuls of beads on it, and deposited it as a present on a mat under the palaver tree of the village. My two carriers took up their loads, and I rode after them as the last man.

I expect we were watched all the time, and turning round on my horse I saw black shadows flitting from tree to tree into the village.

The next Sara-Kabba settlement we arrived at on the same day we found inhabited by people, and not only so, but the chief came out to welcome the white man who had not tried to catch the people, who had not burned the village in which he slept, but who had left cloth and beads behind as presents.

"Lu-lu-lu!" "Welcome! white man. Welcome! white man"—at least I suppose that is what their noisy screaming meant. There was much clapping of hands, and broad smiles on the faces of the bush people. They brought food for which we paid; and when we departed we were escorted by some of them to the next village, and thus on till we left their land.

I had been warned that I might have to fight my way through this people, but I found that the Golden Rule worked with bushmen almost better than in the West End of London. "Do unto others as you would that others should do to you." The nearer to nature people live, the more they obey natural laws. What one calls into a wood one gets as the echo back, weaker sometimes, but still the same word. Peace and friendliness, other things being equal, will beget peace and friendliness.

The French Government is doing its level best to protect the pagan

natives in the Shari Valley, and a better future lies ahead for the Sara-Kabba people.

After traversing Sinussi's territory and crossing a number of difficult streams, we found ourselves in the middle of the rainy season at the edge of the uninhabited wilderness lying between the Shari-Chad Protectorate

Seed-sowing amongst the Kirdi.

and the Anglo-Egyptian Sudan, the watershed between the Congo and Nile systems.

Suffer me to give a short *aperçu* of this last and most difficult part of my traverse of Africa.

"Drip, drip, drip,
Rain, water, mud and mire,
Mire, mud, water and rain."

My helmet became shapeless pulp; not a thread of clothes was dry; all the boxes were clay coloured; the bush path had turned into a brook; the blades of the twelve-feet-long grass, sharpened by the drenching water, cut like knives into one's hands and arms.

Slowly our poor animals toiled onwards, climbing in and out of elephant holes full of water. Every few steps my poor beasts fell.

Now and then we came to places especially depressing, where *terra firma* seemed far away in the deep mire.

The continuous splash of pelting raindrops with periodical growls of thunder from a leaden sky, made one ask the question, as elasticity and spirits went down with the temperature of the outside man, "What in the world did I come to Central Africa for?"

At first, we had some sort of elephant path, but latterly we pushed our way with compass observations through the unknown bush, over rocky hills, and mountains, and through swollen streams. All the provisions had gone. All the flour was eaten, and we were yet some 200 miles from towns and posts that appeared on the maps as British. The lean, starved bodies of the mothers, with their milkless breasts, and the hungry, protruding eyes of the famished babies, became a nightmare. I had given away all my food, beginning with breakfast food; then the rice went, then the flour, and then the rest, and there was nothing left.

Let me give a few notes as I jotted them down at the time:—

"Friday, September 3rd.—Rise at 6 A.M., rain still falling. Leave 6.30. The ground terribly swampy. Several small brooks have become racing streams. After having passed through a swamp that has taken all the *karifi* (iron)—the Hausa expression for strength—out of my horse, he goes down with me in a stream. I get off with a sound soaking. Think of changing when the rain commences again. May as well go on in my wet things. Wading through several small rivers, all of them running west into the Kotto, I walk on till 11 o'clock. The country is very hilly. Hills 1000 feet to 15,000 feet high. It rains all day. Rest in the rain from 11.0 to 12.30. Continue up hill and down hill till 1.30. Rain stops for a few minutes and we form camp. No sun; no glimpse of the blue sky all day. My boots are getting into a very bad state."

Thus day follows day. I had sent five men ahead in the direction of Katwaka and Keffi Genji to purchase food and come back on their own trail, which we intended to follow. I had given them a compass with directions and instructions.

On the second day after leaving the Kotto we ascended through hill country to a plateau land, out of which single hills, between 1000 and 2000 feet in height, rise at frequent intervals. The height of these hills is probably some 3000 or 4000 feet above sea-level. The ground was covered with bush, and here and there were thick jungle, high grass and stretches of bamboo forest. Traces of elephants, buffaloes and lions crossed our track repeatedly. On the third day we lost the spoor of the five men we had sent ahead, continual rain having obliterated them. Two hours were spent in hunting for it, and as the sun came out for a little while, I improved the delay by getting some of my things dried. Time was precious, and so I decided to go straight on without troubling about the spoor of the men ahead of us. In spite of all attempts to secure fresh meat in following every spoor one met, I got nothing during the days between the Kotto River and Keffi Genji.

One morning we heard a large lion grumbling not more than 100

yards away to the right. Without much difficulty I found his spoor and followed it. It was the largest lion spoor I had ever seen, and looked almost like that of an elephant, being deeply imprinted into the wet ground. He had gone towards the south, and I followed him for almost two hours, as we wanted him for food, but failed to come up with him. Another day I followed the spoor of roan antelope. The animals seemed to be playing with us, and walking round us, but we could not see them in the long grass, and, tired out, had to return to the caravan.

The entry that repeats itself in my diary almost every day is the following:—

"Rain all day, and no food. Been out hunting twice and seen nothing. Could not rest to-day; the hungry children need food."

On the plateau rocks appear from time to time, and a good deal of metal-bearing quartz shows under foot. We are now surmounting the watershed between the Shari, Congo, and Nile systems.

We had aimed for a town called Katwaka, marked on the maps in very large type, and with it appear the names of two explorers in print. We found the site and the ruins of some huts, but no people.

On our arrival there I sent out two search parties to look for traces of human beings up and down the Katwaka River. They were away for three hours, and came back without having seen any traces. It was now several weeks since we had seen a human being not belonging to our caravan. I shall not easily forget the wonder in the eyes of my followers as we came upon the first footprints of hunters. The native pathfinder who walked in front of me stooped to the ground and picked up two cobs of maize corn. How wonderful these two empty corn cobs looked to us. The hungry, grey, ashy faces of my people turned to smiles as they gathered round these first earnests of approaching plenty. For were not these two corn cobs proof we were approaching the fields where these were grown, houses and homes, where one might dry one's self: and the land of corn and *dura*, of pumpkins and pea-nuts, of sheep and fowls, these wonderful luxuries that made life worth living?

During the last week the men had eaten nothing but roots from the bush or leaves from the trees, and had boiled and roasted the antelope skins on which they had previously slept.

Now all that would be over, left behind and forgotten. The grave by the little brook we had dug two days before to bury the starved form of one of our Mecca pilgrims: the hungry eyes of the mothers and the famished cry of the babes—all that would be behind.

"Have we not found these two corn cobs, and seen the footprints of the hunters? It may only be an hour and we shall be in the village, or it may be to-night, or at the latest to-morrow. But we are near enough to inhabited country. Now we shall get through all right."

I laid six of my best Sinussi hunters on the spoor, and like hungry hounds they followed it at a half trot. The spoor was two days old and the rain had in many places obliterated it. It was lost from time to time, but found again.

When it disappeared, out spread the hunters, fan-like, from the

centre. A minute's search and a shrill note called the caravan in the direction of the one who had found it.

"On, on, soon we shall reach the village; soon we shall see the first heavy heads of the long-stalked guinea-corn: soon our hungry eyes shall be gladdened by the homes of human beings."

It is two in the afternoon. The heat of the sun overhead seems to make the tired feet heavier. The snake-like line of the caravan becomes longer. Here and there men and women lie down, but we have no time to cheer them on and make them follow as we did yesterday. They are so tired and so weak, and some of them sick to death.

Three o'clock in the afternoon. I am walking behind my horse, which has reached the end of its strength. Thirty of my Sinussi men, with the Sinussi chief, are now ahead of me running on the spoor.

Listen! whatever is this? Angry voices shouting in Arabic. Voices that do not belong to my caravan. I get on my horse, and with some difficulty put him into a gallop. Fifty yards, a hundred yards, and I can see

—a camp. A strong zareba stockade with four huts inside, and

—the smell of roasting meat!

My thirty Sinussi men have taken shelter behind trees, and have their rifles ready. Inside the zareba some ten or twelve men are pointing their rifles at us, and are calling out in Arabic—

"One step forward and we fire."

What a reception. Without taking notice of the threats of the zareba people, and telling my Sinussi men not to move, and certainly not to shoot, I ride on towards the camp alone, my boy with the Union Jack following.

I call out to our opponents, "Salaam aleikum," "Peace with you." I point to the flag behind me and ask them whether they know that "bandera" (flag); I tell them that we are very many, but that we do not want to fight.

Are they British? So are we. On I ramble in my poor Arabic. Slowly their rifles are taken down. They see I am unarmed, and that therefore their fear that we might represent one of the Sinussi slave raids is unfounded. Even here on the borders of the pathless forests, the white man is respected as the powerful agent of peace and justice.

On my inquiry for their leader, a tall man of about forty years of age steps forward, leaves his rifle in the hands of one of the men, and comes up to me.

"Where do you belong to?" I ask him.

The answer comes, "To Malagere and Keffi Genji."

"What are you doing here?"

"I am hunting and have shot a giraffe yesterday."

"Will you show me the way to Malagere? My people are starving, and we come from the west, many days' journey. If you show us the way, I will give you much cloth, and handfuls of beads, as well as silver. You need not be anxious about your meat, for though we are starving, and I am afraid some of the weaker are dying, yet we do not steal; but if you will sell us your meat, we will buy it from you."

Thus a bargain was struck. We formed our camp, bought most of the meat the hunters had; fed the starving; sent back the strongest to carry the faint-hearts into camp, not one of whom was lost; and—rested.

The fearful forest lay behind us, and the lands of Father Nile ahead.

. . . . . .

The Bahr-el-Ghazal Province of the Anglo-Egyptian Sudan is comparatively well known; the Sudd region is beginning to lose its terrors. Time and space does not permit to tell of these.

The self-sacrificing devotion of our Government representatives in the Anglo-Egyptian Sudan and the Niger Territories, who form to-day the vanguard of European civilisation, the powerful agents of peace and justice, is dealing with problems which our quiet citizens in the Homeland cannot conceive. Out there beyond the swampy lands of the Sudd region rules a Naval lieutenant over a land as large as Wales; a man not yet thirty, who lays down laws, punishes evil-doers, establishes markets, bridges rivers, makes roads, drills soldiers, and with his two or three dozen warriors is ready to fight any invading army led by robber chiefs from the north: a man who has secured and who holds the respect of the natives. He explores and surveys the land, settles the unsettled districts, and proves himself a father of his people, a man who, at home, in his simple, unassuming way, passes unobserved and unknown, one of the Empire builders of to-day, one of many. Missionaries who, at one time, were the pioneers and pathfinders into the lands of Central Africa, have stepped back in the Sudan to second and third rank. All honour to the Colonial and Foreign Offices and their representatives for the magnificent work they are doing in Africa. If missionaries to-day cannot be leaders of our Government representatives, they might at least be assistants, and by carrying Christian civilisation to the pagans before these become Mohammedans, prevent the unification of the various divergent elements of the Sudan under the Crescent, and with it the possibility of seeing raised there at any time the green flag of the Holy Moslem War against our representatives of Christian Europe.

COTTON-GROWING WITHIN THE BRITISH EMPIRE.[1]

By J. Howard Reed, F.R.G.S., Hon. Secretary Manchester Geographical Society.

(*With Illustrations.*)

"Year by year we are gradually approaching a very serious crisis, as the shortage of cotton is regular and progressive, and unless supplies of raw fibre are obtained from other fields than those of America, the Lancashire industry will not only gradually languish and decay, but will

[1] A lecture delivered before the Royal Scottish Geographical Society in Edinburgh on March 9, 1911.

completely perish. For this reason it has become all-important that the industry of cotton-growing in British colonies should be fostered and developed, and if the effort is not abundantly successful within a few years, the great staple trade of Lancashire is doomed."

The statement just quoted was made in the course of an address I had the honour of delivering before Section E (Geography) at the meeting of the British Association, held in Sheffield in September last. The vast importance of the subject, and the extreme gravity of the pronouncement made, excited comment throughout the Press of Great Britain, and the statement was referred to by newspapers published in our great Indian dependency. In no case that has so far come under my notice has any exception been taken to the sweeping pronouncement, and I think, therefore, that I am justified in believing that its general accuracy is accepted by those best qualified to judge.

It is, I take it, to the great importance of the cotton problem from a material and economical point of view, and to its very special geographical bearing, that I owe the invitation to address the Royal Scottish Geographical Society on this subject. I value the honour very highly, and shall do my best to justify the confidence which has been reposed in me.

My main purpose will be to consider the geographical aspects of the problem of cotton-growing within the Empire; but I may, perhaps, first be permitted briefly to call attention to the main factors which have produced the present situation, and made the production of raw cotton within British dominions all-important.

Not many years ago the cotton crops of the world were quite sufficient, season by season, to meet the whole demand of the cotton-spinners, with a margin of surplus, which tended to keep the price regular and reasonable. At that time Lancashire to all intents and purposes manufactured cotton goods for the world, the whole output of other countries being comparatively unimportant. Then, as now, the American cotton-fields supplied about 80 per cent. of the raw cotton required in Britain, all the other cotton-fields of the world contributing between them the other 20 per cent.

Even so recently as the season of 1882-3 the crop of American cotton reached less than seven million bales, but this, supplemented by the smaller crops of other countries, was sufficient to meet the combined demands of the mills of Great Britain, the Continent of Europe, and the United States, and to supply a surplus of about a quarter of a million bales. While these conditions prevailed the price of cotton remained fairly constant and reasonable, and the panics of recent years were scarcely known, and never so serious as now.

The demand of Britain for raw cotton is no greater to-day, but slightly less than it was, say, twenty-five years ago, and the weight of the American crop has steadily increased in the meantime.

In this connection it may be mentioned that while the crop of cotton produced in the United States in 1882-3, as just stated, reached less than seven million bales, it had by 1892 increased to over nine millions, and ten years later it reached ten and a half millions, while the crop of

1908-9 totalled over thirteen and three-quarter millions, although it fell back again last season to not much over ten and a half millions of bales. Notwithstanding this fairly steady increase, however, we find that the condition of "shortage" is, generally speaking, getting worse, and has now become almost chronic; so much so, indeed, that the price of the raw commodity has advanced practically to double what it was not many years ago. The difficulty is intensified by the opportunity which "shortage" affords to gamblers across the Atlantic to "corner" the supplies, and to still further force up the price; and of which opportunities the gentlemen referred to do not fail to take full advantage.

If, as has been previously stated, the British demand for raw cotton has slightly decreased during the past twenty years, while the American crops, and the total of the world's production, has been steadily increasing, how, it may be asked, is it that cotton users are so seriously suffering from "shortage"? In reply it may be concisely stated that the trouble is due to the enormous growth of cotton manufacture in other countries, which has produced a hunger for raw fibre which cannot now be adequately satisfied.

This will be perfectly clear when the following figures are considered. In 1891-2 Britain, to supply her spindles, used 3,181,000 bales of cotton, the continent of Europe 3,640,000 bales, while the mills of the United States required only 2,431,000 bales. Last year (1909-10) Britain used 3,053,545 bales (which is 127,455 bales less than the 1891-2 figure), Europe 6,186,930 bales, and the United States of America used 4,707,000 bales. In other words, during the eighteen years under consideration the demand of Britain for raw cotton has fallen 4 per cent., while on the continent the call for fibre has increased during this period 70 per cent., and this on a figure which at the earlier period referred to was already nearly half a million bales larger than that of this country. In the United States the demand has increased by no less than 90 per cent. within the same period. If taken a year earlier, the figures are even more startling. Then Great Britain showed a decrease of only 1 per cent. during seventeen years, but Europe and the United States showed an increase of 75½ and 109 per cent. respectively.

The fall during the last year quoted was doubtless brought about by the smaller crop and a consequently enhanced price of raw cotton, by a general slackness of trade during that season, and more especially by the organised scheme of short-time working which has been more or less generally adopted by the cotton manufacturers of the world.

The American fields, for reasons which we cannot deal with here, cannot be expected to keep pace with the increasing demands of the cotton-using world. It is fairly obvious that, if the requirements of the American mills continue to increase as they have in the past, it will be the countries on this side of the Atlantic that will most severely feel the pinch of "shortage," as naturally the home mills in the neighbourhood of the native cotton fields will have their needs supplied before the manufacturers in the Eastern hemisphere get a chance.

The other well-established though much smaller cotton-fields of the world are even more impotent to prevent "shortage." The fields of

India, for instance, which rank next to those of America, and have an output of between four and five million bales of fibre, produce a short-stapled variety not of much use in this country. About one-third of the Indian crop is used in the home mills, large quantities go to Japan and Germany, and the remainder, in comparatively small consignments, is sent to the other countries of Europe, including Great Britain.

The cotton produced in Brazil, Peru, Mexico, Asiatic Russia, China, Japan, and Korea is almost wholly absorbed locally, and many of the countries mentioned also import considerable quantities of fibre from America and India. Japan, for instance, last year consumed 130,000 bales of American cotton in addition to 914,000 bales of Indian.

No great increase is to be expected from Egypt, as the land available for cultivation is very limited, and even with the irrigation works completed, the increased acreage available for cotton will be very small. Indeed, as has been pointed out, cotton-growing in Egypt proper has practically reached its limit.

Enough has probably been said to emphasise the now well-known fact that there is a great need for increased supplies of raw cotton being obtained from somewhere, and to satisfy us that there is very little prospect of this increase being obtained from the present well-established cotton-fields of the world.

It was the gradual realisation of the facts just stated, brought about by careful study and inquiry, which lead to the formation of the British Cotton Growing Association. I do not propose to describe in any detail the work undertaken and accomplished by this association, but I may perhaps be permitted to say that its operations have been of a most satisfactory character. Though handicapped by lack of enthusiasm, and a very tardy supply of the comparatively small financial assistance asked for, it has performed a monumental work, and its founders and supporters will deserve all credit when the great problem of Empire cotton production has been solved.

Before attempting to describe what has actually been accomplished in the matter of cotton cultivation in British colonies, or dealing with the future prospects of the all-important project, it may be useful to consider some of the main facts and conditions upon which the success of the movement is dependent.

It is quite well known that what may be described as the cotton-growing belt embraces all the land areas falling within a zone extending between 40° N. and 40° S. of the equator. This region, it will be observed, embraces practically the whole of the British Empire except Canada, Tasmania, and part of New Zealand, and quite obviously gives enormous scope for the possibilities of cotton-growing in British Dominions: seeing that the zone includes the whole of the tropical and semi-tropical possessions of the Empire.

There are, of course, many conditions besides latitude upon which the successful growth of cotton depends. The soil must be suitable, the rainfall sufficient, or irrigation at reasonable cost possible.

In the American fields various types of soils exist—clayey, loamy, and sandy, or combinations in varying proportions of any two of these—

and each of them, when properly dealt with, is found suitable for some particular variety of cotton plant. It is evident that if all these various kinds of soils have been found more or less suitable for cotton culture in America, that similar surface conditions within British territories will be equally suitable, provided that other necessities are likewise obtainable.

Professor Dunstan, the well-known authority on these matters, speaking of the British territories which fall within the cotton-growing zone, says: "The rainfall in most of these countries is adequate, and in those in which it is deficient, irrigation is possible in nearly every instance." He goes on to say that: "Records of temperature and rainfall being available, the suitability of the climate for successful cultivation can be readily gauged, and the best time for both planting and gathering of the crops determined." He remarks that: "The suitability of the soil is more difficult to determine, especially in relation to the necessity of manuring, and to the proper rotation of crops." This, however, is, after all, a matter of detail, with which it is not necessary to deal until a special inquiry with regard to the suitability of some particular area, with a view to cotton cultivation, comes under consideration.

The varieties of cotton which are suited to particular regions is a very much larger question; but this, again, only needs to be closely considered when the general suitability of some district has been determined, and can in most cases be best settled within a few seasons by actual experiment with different kinds of seed, and methods of manuring, planting, watering, etc.

The world produces cottons of what may without exaggeration be described as unnumbered varieties—there are, it has been stated, no less than 130 kinds of American cotton. A seed which produces a plant and fibre of certain definite characteristics when grown in a particular way in one country, produces a more or less modified result when treated in another manner, or when cultivated under varying conditions in some other part of the world. Although this is so, the various kinds have, I believe, been classified into six general species, all the innumerable varieties falling somewhere within the scope of one or other of these.

The six classes referred to are as follows:—

1. *Gossypium Barbadense*, the well-known silky and long-stapled variety known generally as the sea-island cotton of America, which has been improved under the special conditions in Egypt into the very valuable variety for which the land of the Nile is famed. It is indigenous to the West Indies, and is said to have been introduced into the United States from Barbadoes, from which island its name is evidently derived. The cotton-fields of the United States bordering the sea-coast produce large quantities of this particular fibre, hence the name —sea-island cotton.

2. *Gossypium herbaceum*, more or less indigenous to India, China, Asia Minor, and Africa, and probably originally derived from the first-named country.

3. *Gossypium hirsutum*, so named from the hairy character of every part of the plant, which is believed to have been originally native to Mexico. It is now found in practically all sub-tropical regions.

4. *Gossypium arboreum*, a tree cotton, as its name implies, grows to as much as 20 feet in height. It is indigenous to India and the borders of the Indian ocean, and yields a fibre of short staple.

5. *Gossypium neglectum*, which produces a short-stapled white fibre of somewhat harsh character. It is native to India, and grows in the form of a low kind of bush, less than 2 feet high. It is of great commercial importance to India, as it is produced in large quantities in the Punjaub, and the North-West Provinces, and contributes the largest share to the cotton grown in the Bengal Presidency.

6. *Gossypium Peruvianum*. This, as its name suggests, comes from Peru. It is largely cultivated in that country and in Brazil, being grown both as a tree and as an herbaceous plant. What is known as kidney-cotton, so called from the shape and arrangement of its seeds, belongs to this species.

Doubtless, when cotton has been cultivated on scientific principles and under the guidance of experts, in our various colonies, new varieties, especially suited to chosen districts, will be developed which will give the most certain and useful results obtainable in those particular areas.

There are many conditions, it need hardly be said, besides those which have been already briefly referred to, upon which the success of cotton-culture within the British Empire will depend. A sufficiency of suitable native labour will be of paramount importance in the development of Imperial cotton-fields, and the particular conditions, habits, and racial aptitudes of aboriginal tribes will have an enormous bearing upon the whole subject.

Means of transport and communication will be a primary condition essential to success, as it is manifest that, however good or plentiful the product of any special district may be, such produce will be an absolute drug in the market unless it can be readily and cheaply transported from its place of origin to the markets where it is required. For this purpose it will be necessary for the extension of railways, the construction of roads, the building of bridges, and the organisation of river and lake transport to keep pace with the progress of the cotton-growing industry in the at present undeveloped colonial areas. Many of the points so briefly referred to will come more or less under notice as we deal with the various districts where cotton-growing is already making more or less satisfactory progress.

During the past eight years the British Cotton-Growing Association, as is well known, have been devoting themselves assiduously to the encouragement of cotton production throughout the British Colonies. Their operations have embraced extensive inquiry, energetic experimental work, and widespread financial assistance, the whole of the branches of their great effort having been distinguished by businesslike intensity of purpose. In some fields disappointment has been met with, while in others great encouragement and success have resulted.

The association has all along been more or less held back by financial considerations, and there is little doubt that had the capital they originally asked for (£500,000) been forthcoming at an earlier date,

they would have accomplished more. In an appeal made to the public a year ago, the association stated that their "pioneer and initial work" was "practically finished," they having "proved beyond dispute that cotton can be grown within the Empire on a large scale, and on a commercial basis." They stated further, that they had "decided to concentrate their main efforts on Nigeria, Uganda, Nyasaland, and the West Indies."

This seems to be a wise decision, not because other parts of the Empire give no encouragement, but simply because the four districts selected show more immediate promise of real success. When the work of cotton-growing has been fairly well established in these fields, the concentration of effort can be relaxed, and more direct attention be given to other regions. It will be worth while to devote some little special attention to the four districts just referred to.

The reports of the progress of cotton cultivation in the West Indies are satisfactory and highly encouraging. A century ago the production of raw cotton in these islands was a considerable industry, and somewhere about 70 per cent. of all the cotton used in Great Britain was at that time obtained from there. Later on, the competition of the American fields gradually forced the West Indian planters to turn their attention more vigorously to the production of sugar and other crops more profitable than cotton, the cultivation of which, as a consequence, diminished and afterwards practically ceased.

Since the Cotton-Growing Association commenced their work the industry has been re-established, and now gives much promise for the future. The cotton grown is that known as sea-island, which has been re-introduced from the islands off the coast of South Carolina. It is of interest to remember that in all probability this plant was first introduced to the American fields from the West Indies, its botanical name (*Gossypium Barbadense*) suggesting that it came originally from the island of Barbadoes, where to-day larger quantities of this particular variety are being produced than in any other island of the West Indian group.

The colonial authorities have given much attention to the re-established industry, Sir Daniel Morris, K.C.M.G., late Imperial Commissioner of Agriculture, having strenuously devoted himself to the work. Since the revival, the exports of cotton from these islands have steadily increased year by year, while the acreage devoted to cotton crops has been regularly augmented. In 1902 cotton fibre and seed worth £9,676 were exported, but this has now increased to a value of £250,000, there being no less than 30,000 acres under cotton crops. It has been found by experience that cotton is a crop which can be grown in rotation with sugar-cane with satisfactory results.

In addition to the cultivation of the high-class long-stapled sea-island cotton, the colonists have also experimented with other varieties with considerable success. Some of the islands appear to be better suited to the growth of "second" and "third" class grades of cotton, and these find a ready market. The planters of the West Indies have been spoken of in high terms by Sir Daniel Morris, who is evidently convinced that they are devoted to the re-established industry.

Picking Cotton at Illushi in Southern Nigeria.

Natives bringing in seed-cotton to Marlborough Ginnery, Lagos, West Africa.

It should be remembered that, although most satisfactory developments may be expected in these colonies during the next few years, their opportunities are naturally limited. The whole area of the islands is only some 12,000 square miles (twice the size of Yorkshire), while the population is only about 1,500,000.

Africa probably affords the greatest hope we have for large supplies of all the varieties of raw cotton which are most in demand in this country. One is impressed with the fact that the rapid development of British colonies within the tropical and semi-tropical portions of the great "dark continent," has only really commenced, just at the time when their vast natural resources are likely to be most in demand. It certainly seems as if Africa is destined in the future to provide this country with vast supplies of raw materials and food stuffs, and at the same time supply important new markets for the benefit of our manufacturing and commercial districts.

From the point of view of cotton, no portion of Africa gives greater promise than does that area which contains the whole of our West African possessions. We have here large areas of territory which possess a soil and climate specially suited to the production of cotton, and where, indeed, an extensive native cotton-growing industry has been carried on, probably for many hundreds of years. These districts, too, are densely populated by peoples identical in blood and race with those who are the successful cotton cultivators in the United States. Indeed, it is not improbable that the earliest cotton-fields in the West were those which the slaves from Africa started with the seeds they had brought with them when dragged across the seas to the western plantations.

The ports of British West Africa are in many cases old-established centres of trade, provided with wharfage and other commercial appliances. They are as well within touch of British ports as are the West Indies or the American cotton States, and possess a native trading population whose natural commercial instincts have been well developed by being for generations in touch with British traders.

It may be remembered that cotton-growing for export is not altogether a new industry in West Africa. At the time of the great cotton famine, Lagos, like the West Indies, did something to help Lancashire. In the year 1869, raw cotton to the value of nearly £77,000 was exported from this one colony. American competition killed the industry, and we find that ten years later the export had dropped to a little over £500. Recent experiences, however, have shown that the possibilities of West Africa are most encouraging. Each of the West African colonies has done something in the way of cotton production during the past few years, and all of them, with the exceptions of Gambia and Sierra Leone, give considerable future promise. The colony of Lagos has been the most progressive of the group from the cotton point of view, and during the season of 1909 provided no less than 12,000 bales of fibre out of 13,200, which was the West African total for that year.

The British Cotton-Growing Association has expended much money and effort in these colonies. Seed of selected varieties has been liberally

distributed, ginneries have been erected and fully equipped, buying agencies have been established, much experimental work has been carried out with a view to improving the cotton fibre produced, and all kinds of encouragement have been given to the local cultivators in the hope of establishing a native industry on satisfactory commercial lines.

The local authorities, with the approval of the Colonial Office, have done all possible to foster the work and back up the efforts of the Association. Money has been expended in the construction of railways and the general improvement of communications, in the development of experimental farms, and, not least, in pursuing measures of government and administration which have established peace and contentment among the native peoples.

In April last year the old arrangements between the Government and the Association came to an end, and a new and progressive scheme was established. By this agreement a sum of £10,000 per year for three years is to be granted from Imperial funds, "the Association undertaking in return to raise a further £150,000 of capital; to continue the work already begun on a commercial basis; to erect and maintain for a period of three years seven pioneering, buying and ginning centres — two in the Gold Coast, one in Southern Nigeria, three in Northern Nigeria, and one in Nyasaland"; "to provide free of charge all seed for growing purposes in the Gold Coast, Southern Nigeria, Northern Nigeria, and Nyasaland; and to carry on travelling and missionary work among native cultivators in the Gold Coast and Southern and Northern Nigeria."

The work that has been done in West Africa, and the undertakings that are now in hand, tell a story of consistent and persistent effort, brimming over with interest and encouragement. The task to be accomplished, however, is so vast, and the ground to be covered so extensive, that much patience and earnest endeavour will be needed for many years to come.

Leaving the West African colonies, and turning to those on the other side of the continent, we find much satisfactory work in progress. In Nyasaland the story of cotton cultivation, so far as it has gone, is quite a romance. In the season of 1901-2 experiments were commenced, and in the following year cotton fibre was mentioned as an export from the colony for the first time, but the consignment only reached the trifling value of £3. This at the time appeared so absurdly small that its mention only provoked a smile. The appearance of the item in question was, however, a much more important fact than was then realised, as it recorded the birth of a new and what is now an important industry.

The crop in Nyasaland, and the export of ginned cotton from the colony, has increased year by year, and has now reached encouraging proportions. In the season of 1908-9 raw cotton headed the list of exports in value, no less than £28,353 worth being exported in that year, while nearly 9,000 acres of land were under cotton crops for the next season's harvest.

Marlborough Ginnery Ibadan, Lagos.

At the end of August last it was officially stated that the cotton industry was "going ahead by leaps and bounds." It was expected that the area cultivated by Europeans, which was then 12,000 acres, would increase in the following year to over 20,000 acres. The native industry was increasing "even more rapidly," and may be expected to exceed the European acreage and output in a few years.

Different varieties of cotton are cultivated in this colony according to soil, situation, and height of the land above sea-level. What is known as Nyasaland Upland is a very superior type of fibre, and commands a better price than the same class of cotton grown in America. It has been reported to be "the finest cotton ever grown from Upland seed either in America or elsewhere."

The Government authorities and the Cotton-Growing Association have worked together to encourage the industry, and their efforts, as we have seen, have met with considerable success. In the Nyasaland Handbook it is stated of cotton-growing, "the industry is thoroughly established and gaining in favour with Europeans and natives alike."

In 1905 a most valuable report was issued dealing in detail with the industry of cotton growing in this particular colony. It was the work of Mr. Samuel Simpson, a cotton expert, was written after exhaustive investigations made on the spot, and must be of much assistance to the local planters. Scientific work of this kind is being vigorously continued by the Agricultural Department, which has recently been enlarged for this special purpose.

The report of the Director of Agriculture for the year 1909-10 is full of most valuable information on suitable varieties of cotton, blights and diseases which affect the plants, and how they may be avoided or mitigated, characters of the varieties grown, methods of selection, etc., and gives a very distinct clue to the helpful and stimulating service which the department is rendering to the colony.

Uganda, the remaining colony of the four upon which the Cotton Growing Association are concentrating their efforts, has proved a most satisfactory field. Hitherto the experiments have been mainly carried out by the Government, who have succeeded in influencing and interesting the native chiefs and impressing upon them the commercial value of the work. The result has been the establishment of a native cultivation which has very rapidly developed most encouraging proportions.

Some difficulty was at first experienced due to the ignorance and inexperience of the people, who mixed up different varieties of seed with disappointing results. The Government officials, however, adopted measures to regulate matters and supervised the disposal of seed and the distribution of that selected for planting. They also carried out "experiments with different varieties of cotton, hybridisation, acclimatisation, and different methods of cultivation." A considerable sum of money has been expended in work of this kind, but the successful results which are now being obtained have fully justified the expenditure.

As is well known, the natives of Uganda are a far more progressive type of people than the generality of native African tribes, and this fact

has doubtless much to do with the remarkable results which have been obtained. The late High Commissioner, Sir Hesketh Bell, K.C.M.G., has spoken in the highest terms of the progress and probable future of cotton growing in the Protectorate. "We have in Uganda," he says, "one of the greatest cotton-fields in the Empire." The country has "not only the soil, climate, and other natural conditions absolutely favourable to cotton growing," but also a population "eager" for that work. The natives, he states, are "so greedy of progress and improvement that they had almost to be restrained."

Within a few years the exports of cotton from this district have grown from nothing to a value, in 1908, of £50,000, and Sir Hesketh Bell has stated his belief that the industry will increase tenfold in a very few years. In order to keep pace with the progress and enthusiasm of the native cultivators, it will be necessary to extend railway and other transport facilities, and work of this kind is being pushed forward by the authorities. It is evident that Uganda gives great promise for substantial supplies of raw cotton for the future.

There are considerable areas within the East African Protectorate where the climate and soil are suited to cotton cultivation, and fibre of very superior character, judged from the Egyptian standard, has been grown. The Association have spent a good sum of money in stimulating the work in the district, and the Government have also devoted considerable sums to the effort. The crops a couple of years ago largely failed for reasons which cannot now be dealt with, and since then efforts have been relaxed and more attention been given to Uganda. The machinery sent out for Mombasa has instead been erected at Kisumu, on Lake Victoria.

Turning to the Sudan we find large areas of suitable land near to where the Blue Nile and the Atbara join the main stream of the Nile. Many years ago the late Sir Samuel Baker drew attention to this district and its suitability for cotton growing. He pointed out that a superior type of plant, giving a long-stapled fibre, was indigenous to the district, and he suggested that some barrage scheme which would store up the waste waters of the Atbara would render some thirty millions of acres available for cultivation. He pointed out that the seasons in that district were so certain that, to use his own words, "neither rain nor dew disturbs the dryness of the atmosphere, and the freshly gathered cotton requires no covering."

Lord Cromer, in his 1903 Report, says of the same district: "There can be no doubt that cotton of good quality can be produced in that country. The Sudan was, indeed, the original home of Egyptian cotton."

In the early days of the British Cotton-Growing movement an American gentleman, Mr. Leigh Hunt, acquired a considerable tract of land near the mouth of the Atbara river, formed a syndicate, and commenced cotton-growing. Much success followed Mr. Hunt's experiments, and although three years ago that gentleman retired from the work, it is still being carried on with increased success. Sir William Mather, in an address on the subject delivered in October last in

Manchester, spoke in the highest terms of the work already done, and of the great promise for this district in the future. He pointed out that at Zeidab, in the province of Berber, there were at present 3,000 acres under cotton crops, the same area under wheat, and almost as much under other crops used like wheat in rotation with cotton. The total area of the present concession is only 12,000 acres, but this will shortly be extended to 40,000 acres. The cotton crop was found to command better prices at Alexandria than "fully good fair" Egyptian fibre.

The Gezira plain, between the converging courses of the Blue and White Niles, forms a splendid field for the production of cotton, and is said to be capable of yielding a crop of best quality fibre of probably 700,000 Egyptian bales. The area of the plain in question is estimated at between three and four million acres, or taken at the lower figure, 4,500 square miles, which is equal to more than a third of the whole cultivable area of Egypt. Wheat of the finest quality can also be grown in this plain, so that two valuable crops can be grown in rotation.

The new railway from the Nile to the Red Sea affords facilities for transport. Barrage works will be necessary in the neighbourhood of Sennar, and an extensive system of irrigation canals will also be required, but there should be no great difficulty in raising the capital for these in view of the natural assets which would by such means be made available.

South Africa cannot, so far as the main territories are concerned, be expected to supply much in the way of raw cotton, at any rate, for some time to come, although good samples of fibre have been produced in Cape Colony, Natal, and the Transvaal. Labour difficulties will be likely for some time to come to prevent any great development.

Rhodesia, however, gives much promise for satisfactory supplies in the not very distant future. Labour is likely to be found in sufficient quantities, and the climate and soil in several districts are quite suitable. It is believed that there are great hopes of a native industry being developed under European guidance, much on the lines of those in Uganda, Nyasaland, and West Africa, but although good samples of cotton have already been produced the industry is only now emerging from the elementary stage.

The South African Chartered Company have devoted a considerable sum of money to the development of this work, and they invited the Cotton-Growing Association to give financial assistance on the same lines, and to undertake the management of a well-considered scheme. This invitation was accepted, an expert was sent into the country, and his reports were found to be so encouraging that arrangements have been made for the establishment of a buying and ginning centre at Kafue Bridge on the Rhodesia Railway, and every effort is to be made to establish the industry.

It will have been realised from what has been said that Africa promises in the future to supply a large share of the raw cotton which is required if the British cotton industry is to be saved from disaster,

and from this point of view the "dark continent" has not inaptly been described as "Lancashire's hope."

Outside of Africa, and apart from the West Indian fields with which we have already dealt, there are large areas of the British Empire which can and do grow cotton, and which may be expected in the future to do something to meet the needs of the mother country. Time, however, will not allow us to do more than merely glance at these.

India and Ceylon will doubtless under special guidance and Government attention do something to improve the general quality of the fibre they produce, but much native prejudice and natural conservatism will have to be broken down. The short stapled cottons grown by the native Indian cultivators give much heavier crops than the higher class varieties which are in demand in this country, and so far the native growers do not seem disposed to risk a reduction of quantity for the sake of better quality.

In the district of Sind cotton from Egyptian seed has been grown with considerable success. In 1909 some 2,500 bales (400 lbs. each) of this cotton were produced. The true secret of the production of a better Indian cotton seems to be the gradual improvement of the native seed by selection and special cultivation under the guidance of trained experts.

Some few months ago an influential deputation of cotton manufacturers and others interested waited upon Lord Morley and requested assistance from the Indian Government with a view to the improvement of the fibre obtained from the Dependency. No great satisfaction was obtained, although the Minister was most sympathetic. The requests made by the deputation may be summarised as :—

The establishment of cotton departments with suitable staffs in each Province. Concentration upon indigenous cottons. Selection of seed. Importation of fertilisers. Imperial financial grants in aid of the work.

Lord Morley pointed out that expansion of agricultural production could not be brought about rapidly ; that the funds of the Indian Government are not unlimited, and that it would not do for the Government to concentrate its energies upon a single branch of production. He remarked that a Department could do a great deal less than was supposed, but it could do something, and he promised that that "something," whatever it might be, should receive the consideration of the Agricultural Department of India.

Cotton has been grown in Ceylon for a long time, but only in a primitive manner by the natives for their own purposes. The Government and the Cotton-Growing Association have spent considerable sums of money in experimental work, and in the equipment of a ginning plant. If the authorities continue their efforts it is hoped that a useful native cotton-growing industry may be established in the north of the island.

The other possible British cotton countries are Australia, Borneo, Fiji, Straits Settlements, Malay States, the Seychelles, Mauritius, Cyprus, the Maltese islands, and St. Helena, but no great output of fibre is to be expected from any of these districts, at any rate for some time to come.

In Australia, the provinces of New South Wales, South Australia, and Queensland can all grow cotton of good quality, and the same may be said of New Guinea. No great progress with the industry has, however, been made, nor is such immediately likely, owing to the lack of suitable labour. At present the production of established and more remunerative branches of agriculture absorb all the available workers. Experiments, however, are still being carried on, and some cotton fibre is exported. British Borneo is, perhaps, a more hopeful field, as labour there should be fairly plentiful, and a native cotton is grown for local purposes which is said to be practically equal to that of Egypt, being of specially fine and strong character.

In the Fiji Islands good cotton can be grown, which is noted for its whiteness, long staple, and silky gloss. A generation ago a considerable quantity of fibre came to this country from these islands, and so late as 1873, about £93,000 worth of Fiji cotton was exported. The industry received much stimulus during the great cotton famine period, and a considerable quantity of sea-island fibre was grown. The return of peace and the resumption of cotton-growing in America caused the output to fall off, careless cultivation did the rest, and the industry practically disappeared. Recent experiments have shown good results, and past experience suggests some promise for the future.

In the Straits Settlements and the Malay States cotton has been cultivated, but with poor results. The climatic conditions are variable and unsuited to cotton, the plants are specially liable to suffer from many kinds of parasites, and the supply of labour is deficient. The natives of Mauritius and Seychelles grow cotton on a small scale for their own use. Samples of this have received approval in England, and there is hope that a useful output may some day be obtained.

The island of Cyprus is capable of producing a good variety of cotton, and in past years considerable cultivation was carried on, much fibre being exported to France and the Levant, and small quantities to England. Lack of water, poor seed, locusts, and general neglect practically destroyed the industry, but it was revived by the introduction of better seed and a system of irrigation. Under proper expert care the island may in time do a good deal to assist matters.

Malta, and St. Helena, although so far apart, both grow cotton of useful character. In each case, however, it is only at present grown to meet local needs, and although under suitable direction and stimulus the produce can doubtless be much increased, the possible area for cultivation is necessarily very limited.

From our general knowledge of this subject, and from our discussion of it this evening, I think there will be a general agreement that the problem of Empire cotton-growing is an extremely important one, and that the continued commercial prosperity of a large portion of this country is of necessity greatly dependent upon its solution.

I think we may further agree that various portions of the king's dominions are climatically quite capable of contributing something towards the large supply of raw cotton which we need, and that some of the colonies give distinct and hopeful promise for the future. The

energetic operations of the British Cotton-Growing Association have produced eminently satisfactory results. The work they have done has been of a most praiseworthy character, but after all what has been accomplished is extremely small compared to what is actually required, if the great cotton industry of Britain is to be saved.

We require three and a quarter millions of bales of raw cotton, each of 500 lbs. weight, every year to keep pace with the present demand of our spindles. During eight years the combined efforts of the Cotton-Growing Association and the Government authorities in the various colonies have only succeeded in producing 116,700 bales of 400 lbs. weight each, which it will be seen is only one-thirty-fourth of what is required each season.

Something has been done, progress has been made, and the British Cotton-Growing Association may be congratulated upon the good work they have accomplished. Much more, however, is needed, and if the problem is to be satisfactorily solved, all those interested will need to do their part, to do it at once, and with energy and persistence.

It has often been said in north of England circles that geography in Lancashire is spelt c-o-t-t-o-n; this may be so, but if it is, I would remark that so far it has only been interpreted as meaning the export of manufactured cotton. If, however, the industry is to be saved, it is necessary that not only Lancashire, but the whole country should realise that a wider interpretation is required, and that in this sense geography must also mean the importation of raw cotton.

So far, Lancashire and Britain generally have been asleep with regard to this great problem. For eight years the pioneers of the Empire cotton-growing movement have been appealing for half a million of money, and even as this is written, the sum is not complete. The money could, and should, have been subscribed within a few months at most. What is half a million of money in comparison with the salvation of an industry worth to the country over £100,000,000 per annum?

It is questionable if the expenditure of £500,000 is anything like enough to establish the industry of cotton-growing within the Empire, or whether a sum of £5,000,000 is not more like the figure required. Whatever the necessary amount may be, however, it should be forthcoming, and will have to be found. An increased supply of raw cotton is an imperative necessity, and it must be obtained, or the staple industry of Lancashire will decline and decay, even if it does not ultimately entirely disappear.

THE VALLEY OF THE NILE.[1]

By Captain H. G. Lyons, D.Sc., F.R.S.

In the course of the twelve years which have elapsed since the Dervish Army was defeated and dispersed at Omdurman our knowledge of the

[1] Abstract of a lecture delivered before the Society in Edinburgh on March 23, 1911.

upper part of the Nile Basin has been rapidly increasing. Exploration has given place to detailed investigation, and the urgent necessity for increasing the supply of water in Egypt during the summer, together with the increasing requirements of the Sudan itself, make the study of the hydrography of the Upper Nile one of the first problems for solution.

The vast extent of the Nile Basin, the varied conditions existing in different parts, from the almost continuous rainfall of the tropical forests to the rainless deserts of Nubia, the different parts played by the tributaries, and the many peoples dwelling within it, would need a series of lectures to deal with them adequately. I propose to select three regions, each of a special character, and differing greatly from one another, which may illustrate special types of those included in the Nile Basin.

First, however, the basin as a whole must be briefly alluded to. Extending from lat. 4° S. to the Mediterranean Sea, its principal features are the equatorial plateau arising to 4000 or 5000 feet above sea-level, and the tableland of Abyssinia which reaches 6000-8000 feet, on which many peaks greatly exceed these heights. It is from these two elevated regions that the great tributaries of the Nile, the Bahr-el-Jebel and the Sobat, the Blue Nile and the Atbara flow. The rest of the basin is comparatively low and receives a very scanty rainfall, contributing but little to the main stream. On the equatorial plateau rain falls heavily in the spring months, and as the summer advances the zone of rainfall moves northwards over the southern plains of the Sudan, providing Abyssinia with its rainy season of June to September from the southerly and south-westerly monsoon currents of moist air. Thus the magnitude of the annual flood in the Blue Nile is directly controlled by the excess or defect of the monsoon of Africa. On the abundance of rainfall depends the Nile flood on which the fertility of Egypt and the cultivation of the plains of the Sudan south of Berber depend. The equatorial plateau supplies a considerable volume of water, but much that flows down northern slopes floods the lower plains and is in time evaporated; only that which reaches the Bahr-el-Jebel is in any way an effective addition to the Nile supply. This river descends rapidly from the level of the Albert Lake until Gondokoro is reached, after which it flows in a shallow valley through the plains, just as do the southern tributaries of the Bahr-el-Ghazal after they have passed the slope of the ridge which here forms the divide between the Nile and Congo. The lower valleys of all these rivers are inundated by their own flood waters, by the local rains, and by the Sobat river rising in flood, so that a vast development of marsh vegetation occurs, mainly restricted to the valleys and deltas of the different rivers. The storms of the rainy season drive masses of this vegetation from the lagoons into the main channel, where it may accumulate at a sharp bend or in a narrow reach until it forms an obstruction (sadd) which prevents all navigation. The lower reaches are most liable to this, and constant watchfulness has to be exercised during the rains to remove such obstructions before they become too large and compact. The flooding of these marshy valleys and the consequent evaporation from them results in a loss of more

than half the supply in the most favourable season, so that the main channel of the Bahr-el-Zaraf is now being improved and regulated in order to pass a larger proportion of water to Egypt in the summer months and supplement that which is stored in the reservoir at Aswan.

To the north of Khartum we enter upon a very different region, practically rainless, a vast desert through which the Nile maintains a scanty strip of vegetation on either bank. The slope is here greater than in the White Nile, and for short distances in the rapids may be considerable. These rapids, or cataracts as they are less correctly termed, greatly hinder navigation except in time of flood at many points between Khartum and Aswan, so that the caravan routes of the desert and the railways are employed to pass round them. Formed of masses of hard crystalline rocks these cataracts, together with the reaches of comparatively low slope up-stream of them, are naturally adapted for the construction of reservoirs, and all those between Khartum and Aswan were carefully surveyed and studied before it was decided to increase the height of the dam at the first cataract. The scanty belt of cultivable soil along the river bank has always supported a small and scattered race, the Nubians or Berberins, and the recent systematic survey, archæological as well as topographical, of the reach, which will be submerged by the Aswan Reservoir when complete, has brought to light much that is of interest concerning the early history of this race, and the varying influence of Egypt and the Sudan upon Nubia throughout its history.

To the north of Aswan the Nile enters the fertile valley of Egypt where it has laid down those level plains of alluvium on which a dense population of eleven millions dwell. Doubtless before the dawn of the historic period this portion of the valley was much in the same condition as that of the Bahr-el-Jebel to-day, with which in length and breadth it generally corresponds. Lagoons and a belt of marshes extended along the edge of the desert, and cultivation was then limited to the higher land nearer the river banks. Gradually as centuries passed by the cultivable area extended until by the twelfth or fourteenth century B.C. we no longer hear of the nobles of Egypt hunting, fishing, and snaring birds in these marshes along the valley margins, and such features were restricted to the northern delta. Continued deposition of silt by the waters of the annual flood built up the flood plains of the valley and the delta, and added annually a thin layer of silt on which the seed was scattered in November to produce an abundant harvest which was gathered in April and May, after which the land, except on the river banks, lay fallow till after the waters of the inundation had drained off in October and November. But modern conditions of increasing population and intensive cultivation have caused a great modification of what may be called the natural irrigation system of the country. To-day the delta and the valley as far south as Assiut have most of their lands under perennial irrigation, in which the land is no longer inundated by the summer flood, but water is supplied to it by canals throughout the year, allowing a continuous rotation of crops and especially admitting the cultivation of cotton, which, sown in March and picked in October, is

to-day the most valuable crop of the country. Rapid development of the irrigation system during recent years has enabled the area sown to be greatly increased, but with such intensive cultivation many minor factors which were formerly of small account must now be seriously investigated in order to guard as far as possible against diminished yield or deterioration of quality. The subject is now having close attention, but it is not a question of tracing a general cause for a less satisfactory crop but rather of recognising that many factors are at work, some in one place, some in another, and of determining in each area which are those of especial influence and importance.

THE HIGHWAYS AND HOMES OF JAPAN.[1]

A Reviewer should never write in superlatives. Yet it is difficult to refrain from this exaggerated form of praise after reading Lady Lawson's really fascinating book. It is nigh on twenty years since the present reviewer saw Fuji San disappear below the horizon, and nearly thirty since he first set foot in the island kingdom of the East. Lady Lawson visited the Japanese (not merely Japan, observe) after the great war with Russia. Nevertheless, how comparatively little in these decades of so-called "tremendous advance" have the subjects of the Son of Heaven altered their customs and their habits of life. The highways and homes of Japan, as depicted by Lady Lawson, are just the highways and homes of last century. Every page brings back clearly to the memory the scenes witnessed during the eighties, when as yet the Powers of Christendom refused to admit Japan as an equal among the nations. In all the fundamentals which make a stable national life Japan was just as efficient then as now: only she had not shown that she could handle guns and ironclads and could manœuvre large masses of troops as efficiently as the most feared or the most envied of the Powers of the West. The leaders of Japan have during the last half century reorganised their army and their navy and their whole system of education: steam and electricity have opened up communications and brought the furthest limits of the empire into closest touch; imports from Europe and America have modified certain superficial aspects of life, especially in the great cities: students have forsaken the Chinese classics for the science and philosophy which are more in harmony with the spirit of the age: but, if we may judge from the pages of Lady Lawson's book, the real home life of the Japanese has altered in nothing essential during these years of storm and stress.

This truth is borne in upon us by the numerous illustrations which adorn the book, and which are reproduced almost entirely from Lady Lawson's own photographs. Here we have children playing games and being tubbed, maidens gracefully dressed exchanging "good morning," pilgrims and students *en route* along the dusty road, the blind *amma*

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[1] *Highways and Homes of Japan.* By Lady Lawson. London: T. Fisher Unwin, 1910. Price 12s. 6d. net.

massaging his patient, strolling musicians with *koto* and *gakki*, a Japanese family by a wayside shrine, a "fair burden" being carried in *kago* by two coolies across a slender bridge, etc., etc., all scenes differing in no particular from what has been witnessed for centuries in the land of the Rising Sun. A few pictures, however, do show the influence of the West, such as General Oyama in his garden, and Admiral Togo at a garden party, in which the inartistic character of our western costume obtrudes itself painfully on the eye.

Surely it is a healthy sign that a people which has so fully appropriated the material civilisation of Europe and America has retained practically unaltered the flavour of its own nationality in its customs and traditions. Every page of Lady Lawson's brightly-written book tells the tale of Old Japan, for the simple reason that on highway and in home the Japanese of to-day lives in large measure the life of his ancestors. All the distinctive features of social and commercial life are touched upon with no uncertain hand. During her two years' residence in the country, Lady Lawson came into as intimate touch with the Japanese as was possible for a Western. She became a member of the Red Cross Society, and her chapter on this organisation is not the least interesting part of her book. Under the direct patronage of the Emperor, the Empress, and the Imperial Household, this truly national Society has seized hold of the conscience of the people in a wonderful way. To be a member of the Red Cross Society is equivalent to membership of a fashionable club in London. State officials of a certain status must of necessity be members. Its remarkable organisation came into evidence during the great War, in which the mortality due to wounds and disease was reduced to limits far below what was ever dreamed of as possible among belligerents of the West.

A particularly interesting chapter is the one on some special Shinto festivals. Lady Lawson had the good fortune to be present at two State ceremonials in honour of the officers and men of the Navy who lost their lives in the war of 1904-5. After describing the picturesque ritual of one of these, she remarks: "I have witnessed funeral rites in many lands, from the stately service in the crypt of St. Paul's Cathedral to the hillside *kurd* of aboriginal tribes in Southern India, but none have more clearly shown forth the reality of immortality than this *Reisai* (spirit festival), which contained all the elements of Christianity—Faith, Hope, and Charity (which is Love)—and in which there was a grand suggestion of the Infinite, which helped one to understand the patriotic sacrifice of lives laid down gladly for the Emperor and country regardless of individual aims and ambitions."

Another feature which marks off this book from almost all others is the account of the pearl culture which has been developed by the Japanese with unique success.

In her appreciation of the artistic side of the Japanese, Lady Lawson leaves nothing to be desired. The simple satisfying beauty of the moats and walls of old Yeddo Castle, within which lie the Imperial Palace and Garden, the landscape gardens and floral fêtes of Japan, the making of cloisonné, lacquer, and porcelain, the Japanese sword and its adornments,

the arts of carving, weaving, embroidering, and all the artistic productions which mark a high civilisation, these and much else find a sympathetic treatment in her pages. Yet the other side of the account is not neglected: and in a chapter headed "The disagreeables of Japanese Life" the intending visitor will receive a much-needed warning that even in fair Japan there are things we would much rather do without.

From the point of view of technical geography, the work under review is not of any direct value. That is not its aim; but it is easy to see that the authoress has travelled far and wide, and has gathered her experiences from many parts of the country. The only chapter which touches on the scientific aspect of things is that devoted to earthquakes. The climate of Japan is disposed of in a couple of pages. The chapter on commerce is brief and general, and in no sense statistical; but it brings out clearly the great development which industrial Japan is experiencing. Tall chimneys and smoke of furnaces and foundries are gradually defacing the natural beauties of land and sea. Will the evils of industrialism, so evident in this land, follow also in their train? The outlook is not very hopeful, with increasing pauperism as a legacy of the war. Will Japanese statesmen, gaining wisdom by a study of our mistakes in Poor Law and Factory Acts legislation, be able to realise a golden age when all labour, whether factory or domestic, shall be estimated at its true national or social value? Much of our industrial and educational legislation has influenced, not always for good, the conditions of home life; how will Japanese homes be influenced by this great industrial development? On such subjects Lady Lawson gives no utterance. Probably she is wise.

There is, however, one set of transactions in the past of which the authoress does not seem to us to give a perfectly satisfactory account. The facts stated are correct enough: but some of the expressions used seem to suggest an interpretation which may well be questioned. For example, we are told that since 1897 "the silver dollar of Japan has been valued at 50 cents in gold. In 1874 it was worth over 100 cents, yet foreigners preferred to be paid in silver. . . . The yellow metal has quadrupled in value during Matsukata's lifetime." Foreigners were paid in silver in the earlier days because the so-called gold dollar of Japan was of no value for external purposes. Within the country there were practically no gold coins, simply paper money or *kinsatsu* (= gold paper). The gold dollar was a curio. The silver dollar was also not used in currency throughout the country: but its value was determined by the silver standard used all over the East. It was comparatively steady; whereas the government *kinsatsu* fluctuated tremendously, gradually settling towards a value in the neighbourhood of the silver dollar, which, as every one knows, depreciated steadily as year followed year during the eighties. Then, when the nominal gold dollar was at par with the real silver dollar, the Japanese National Banks issued *Ginsatsu* (= silver paper) with the same face value as the *Kinsatsu*. Thereafter the nominal gold dollar in the country ceased its fluctuations, but had no more purchasing power than the silver dollar, which now became the current coin. Finally, gold was reminted: and the mono-metallic standard was established, with

the gold dollar or Yen at half the value, about 2s. sterling, which it was supposed to have had in the early days. If the silver Yen is valued at 50 cents in gold, then it is equivalent to 1s. of our money; in the early eighties it was worth nearly 4s.! Meanwhile necessary commodities have steadily risen in nominal price. When we are told that the yellow metal has quadrupled in value, we naturally ask, in terms of what standard?

Short historical and biographical sketches are introduced here and there, and enhance the value of a book which is eminently readable, and which cannot fail to give the thoughtful reader a true picture of the Japanese in their island home. The book, in short, forms an important contribution to the literature bearing on the Far East.

C. G. K.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Diploma of Fellowship.

At a meeting of Council held on the 30th March, the Ordinary Diploma of Fellowship was conferred on Miss Ella R. Christie, subject to her compliance with the prescribed conditions.

Atlas of Scotland.

The Council unanimously agreed to bestow the patronage of the Society on the Survey Atlas of Scotland which Dr. J. G. Bartholomew has now in preparation.

Erratum. British Work in Spitsbergen.—In Dr. Rudmose Brown's paper on this subject in our last issue, on p. 187, line 22 from the top, the words "much of" should be inserted before "the discovery of Spitsbergen."

GEOGRAPHICAL NOTES.

Polar.

The British Antarctic Expedition.—The *Terra Nova* returned to New Zealand towards the end of March, bringing back despatches from Captain Scott. The southward journey was stormy, and pack ice was encountered in lat. 65° on December 6. The pack proved to be very heavy, and twenty-one days were spent in pushing through 380 miles of it. Open water was reached on December 30 in the Ross Sea, and Cape Crozier was reached on January 3, though the heavy swell prevented a landing being effected. MacMurdo Sound was found to be unusually open, and winter quarters were set up at Cape Evans, 14 miles north of the Discovery

Station. The stores were landed with some difficulty and with the loss of one of the motor sledges, which dropped through a hole in the ice. After a house had been built, towards the end of January, Captain Scott set off to the south to lay down depôts. From this expedition he expected to return at the beginning of April.

The ship, on leaving MacMurdo Sound, proceeded eastwards along the edge of the Great Ice Barrier, but was unable to effect a landing at Cape Colbeck, and was obliged to return to the Bay of Whales, where, as explained below, the *Fram* with Captain Amundsen's party was found, very unexpectedly. The *Terra Nova* then returned to MacMurdo Sound, and left a message for Captain Scott. Turning northwards again, the ship left a party at Cape Adare (Victoria Land), and then proceeded to investigate the pack in the vicinity of the Balleny Islands. No pack was found immediately south of the islands, and a mountainous coastline was discovered in 69° 50′ S. and 163° 20′ E. This coastline was followed north-westward for about thirty miles, but the pack prevented a near approach. Many interesting soundings were taken, and the biologist obtained some excellent hauls. The pack was finally left in 64° 23′ S. and 161° 39′ E.

Amundsen's Antarctic Expedition.—Captain Amundsen, whose Arctic expedition (cf. vol. xxvi., p. 379) was to include some preliminary oceanographical work in southern seas, has apparently so far altered his plans as to be about to attempt an attack upon the South Pole itself. Some uncertainty as to his plans has existed, but the *Terra Nova*, Captain Scott's ship, while following the Great Ice Barrier westwards from the direction of King Edward VII. Land, found the *Fram* in the Bay of Whales, an inlet in 165° W. long. It was intimated that Captain Amundsen, who has 115 Greenland dogs, and an equipment of sledges and skis, intends to attempt to reach the Pole by way of the Beardmore Glacier, that is by the same route as Captain Scott. The *Fram* has returned to Buenos Aires, which was reached on April 19, and will go back in October to pick up the polar party. She brought with her a message from Captain Amundsen to the effect that he intended to start for the south on the departure of the *Fram*, *i.e.* in February, and thus to make a winter attempt on the Pole, but doubt still exists as to the details of his plan.

Dr. Mawson's Antarctic Expedition.—Dr. Mawson gave recently a lecture before the Royal Geographical Society setting forth his plans. The fact that the *Terra Nova* has been obliged to land a party at Cape Adare has led him to modify his plans to some extent (cf. p. 100), in that he will avoid the vicinity of this region, and limit his explorations to a region further to the west. He proposes to employ about fifty men in connection with his expedition, and to attempt the investigation of a large tract of land on the margin of the Antarctic Continent. No attempt will be made to reach the geographical pole, but if possible the magnetic Pole will be reached from the main base. It will be remembered that in Sir Ernest Shackleton's expedition, Dr. Mawson reached the magnetic Pole from the shores of the Ross Sea, so that if he succeeds in carrying

out his present intention, he will have established a line of observations right across the north-eastern shoulder of Victoria Land.

General.

Royal Geographical Society's Awards.—The annual awards of this Society have been made as follows:—The Founder's Medal to Colonel P. K. Kozloff, for his explorations in Central Asia, which began in 1883, and have been continued up to a recent date: the Patron's Medal to Dr. J. B. Charcot, for his two important expeditions to the Antarctic Continent, details of which have been already given here. The Victoria Research Medal goes to Captain H. G. Lyons, at present Lecturer in Geography in Glasgow University, for his work in connection with the cadastral survey of Egypt, and for his scientific memoirs, notably that on the Nile Basin. Dr. Wilfred Grenfell receives the Murchison Bequest in recognition of his many years' work in Labrador: the Back Bequest has been awarded to Dr. Arthur Neve on account of his work in Kashmir; and Mr. R. L. Reid, who has investigated the geography of the Mobangi region in the Congo State, receives the Cuthbert Peek Fund.

The Tenth International Geographical Congress.—Among the further details now available in regard to this Congress, we note that two excursions are to be arranged during the meeting at Rome, of which members can choose one, these being to the Monti Albani, and to the principal sights of the city. Several excursions are to be arranged at the close of the meeting, and at the conclusion of these the members who have taken part will meet in the city of Turin, where they are invited to visit the Exhibition.

Association of American Geographers.—Professor Albert Perry Brigham, Secretary of this Association, has furnished us with the following notes in regard to it:—The seventh annual meeting was held at Pittsburg, December 29-31, 1910, under the presidency of Dr. H. C. Cowles of the University of Chicago. His address was upon the subject, "The causes of Vegetative cycles." Public lectures were given by Professor Mark Jefferson on "Rocky Mountain Forms," and by Dr. Cowles on the "Origin and Destiny of the Everglades." Professor Rollin D. Salisbury conducted a round table conference on the "Purposes of Geographic Instruction, and the phases of the subject best adapted to these purposes." About twenty-five papers were read by the members.

The Association has decided to issue a publication, and has appointed the following Publication Committee: Richard E. Dodge, Chairman and Editor, Alfred H. Brooks, Henry C. Cowles and Ralph S. Tarr.

Following upon the discussions of the round table conference, the Association adopted the resolutions herewith appended:—"The Association of American Geographers at its Pittsburg meeting, December 29-31, discussed the present status of Physical Geography in secondary education and passed the following resolutions: Resolved, (1) that in the opinion

of this Association Physical Geography fully deserves to retain a place in the High School: (2) That the disappointment or dissatisfaction sometimes expressed regarding the results of teaching this subject is in large measure due to inefficient teaching: (3) That as a means of removing this dissatisfaction, superintendents and principals are urged to procure teachers of physical geography adequately prepared in their subject, and to entrust the subject only to such teachers: (4) That no teacher of physical geography should be appointed in any educational grade who has not made serious and special study of the subject in a higher educational grade."

The next meeting of the association will be held in Washington in connection with the American Association for the Advancement of Science.

Commercial Geography.

New Swiss Tunnel.—The Loetschberg Tunnel through the Bernese Alps in the vicinity of Kandersteg was pierced on March 31 after four and a half years' work. The tunnel is 9¼ miles long and is thus only slightly shorter than the St. Gothard. It leads from Kandersteg to Goppenstein, 17½ miles from Brigue, and is destined to be a feeder for the Simplon. It will shorten considerably the journey between London and Milan or Genoa. The new route will omit Bâle, for the trains will leave the present line at Belfort, and passing the Jura by a new tunnel will run *viâ* Delle and Biel to Berne, then *viâ* Thun and Spiez to Kandersteg, Brigue and the Simplon. The date of the official opening of the new route is given as May 1, 1913.

EDUCATIONAL.

Not only teachers but all those interested in geography from whatever point of view will welcome the collection of Professor W. M. Davis's essays into one volume, and their publication as *Geographical Essays* (Ginn and Co., Boston). As Professor Davis has contributed many papers to geographical publications, the proceedings of learned societies, and so forth, it was found impossible to republish all, but Professor Douglas Wilson Johnson has undertaken the task of selection and editing. The essays here collected are of varied scope and standpoint, but they will be welcomed as giving the gist of Professor Davis's views on many important topics. As is well known, he has contributed not a few new terms to geographical nomenclature, some of which have been much criticised, while others have won a considerable measure of acceptance, largely on account of the activities of the band of workers which Professor Davis has gathered around him in America. In some of the essays he defends his new terms in vigorous fashion, in others he sets forth his own observations, while in others again he discusses educational problems or the best methods of teaching at various stages. Professor Davis has made and is making so deep an impress upon present-day geography that even

when his views are not accepted *in toto* they cannot be neglected by either student or teacher. His frequent visits to Europe also have led him to devote much attention to problems of Old World geography, problems which he has attacked from the point of view of one most of whose work has been done on another continent. Necessarily, therefore, the solutions which he offers of these problems present interesting novelties, and the inclusion of papers on such subjects increases the value of the book for European readers. We cordially recommend it to the notice of our members.

We have received an illustrated pamphlet entitled *Notes on the Orographical Map of Europe*, by Messrs. A. W. Andrews and B. B. Dickinson (Macmillan and Co., London), which teachers will find of great use. It discusses in great detail, with the help of illustrations, the orographical features of Europe and the adjacent regions, in their relation to lines of communication, climate, distribution of vegetation, possibilities of cultivation, position of towns, and so forth, and concludes with a useful section entitled "Hints to Teachers on the use of the Map of Europe." There can be no doubt of the supreme importance of orographical maps in the teaching of geography, and the authors have much to say that is suggestive upon methods of employing them, while they also succeed in bringing together in a useful form much scattered information, which would have otherwise to be sought for in many separate books and papers.

NEW BOOKS.

EUROPE.

An Englishman in Ireland. By R. A. Scott-James. London: J. M. Dent and Sons, Ltd., 1910. *Price 5s. net.*

In this volume we have an account of a three-weeks' trip in a canoe through the heart of Ireland from Belfast to Killaloe, via the Lagan Canal, Loughs Neagh, Erne, and Allen, and the river Shannon. The trip was singularly uneventful. As usual the stranger was everywhere received with true Irish cordiality and welcome, except on one occasion when he was mistaken for a policeman in disguise, a mistake which was easily explained away. The only thing that interfered with the comfort of the trip was the occasional bad weather. The writer has much to say about the scenery through which he passed, and varies the narrative with reminiscences of historical events.

Lands and Their Stories. Book V. Europe and its Peoples. By H. W. Palmer. With Appendices by David Frew. London: Blackie and Sons, 1910. *Price 1s. 8d.*

This is a member of an interesting series of readers, whose object is to aid in the correlation of history and geography. We note that Europe in the author's sense seems to exclude the British Isles, but this is probably rather because these islands are treated in other volumes of the series, than from a desire to remodel geographical terminology. Excluding the British Islands then, the book gives lively sketches of different parts of the continent, attention being paid both to

historical events and to geographical conditions. We have noted a considerable number of trifling errors, from most of which the diligent use of a "Baedeker" would have saved the author. More important mis-statements also occur. Thus, it may be pointed out that the olive does not thrive in the plain of Lombardy, as asserted, and that no single peak of the St. Gothard massif attains a height of 12,000 feet. The book is well and copiously illustrated, some of the plates being very successful. It would, we think, be an improvement if the views of scenery at least were more closely correlated with the text.

The Mediterranean Cruise. By Bruce Millard. New York and London: G. P. Putnam's Sons, 1910. *Price* 9*s.*

Practically written and well illustrated, this book should commend itself to travellers. Mr. Millard describes Palma, Gibraltar, Tangier, Tetuan, Algiers, Tunis, Tripoli, Alexandria, Cairo, the Up-Nile trip to Abu Simbel, Jerusalem, Bethlehem and the Dead Sea, Beirut and Damascus, Smyrna and Ephesus, Constantinople, Athens, Malta, Syracuse and Sicily, Cagliari, and Ajaccio. The author remarks that "Cairo is the chief objective of the majority of travellers doing the Mediterranean," a remark which specially applies to his American compatriots. We are glad to receive his admission that "Egypt has prospered greatly under British occupation," but he ought not to have said that Lord Cromer was succeeded by "Lord Wingate," as there is no such peer as yet. Of course, Sir Eldon Gorst succeeded Lord Cromer as British Agent, and General Sir Reginald Wingate was Sirdar of the Egyptian Army. He does not give the best hotels for those visiting Syracuse, Taormina, or Palermo, and he ought to have stated that Corsica cannot be seen by adhering to its railway system. Occasionally he soars far above mere guide-book details, as when he exclaims: "It is said that trade follows the flag; ah, but there is, far overshadowing that, an altruism in the wielding of Empire such as Britain's, beside which envy and condemnation of human error may well be silent; and America, as the chief exponent in policing God's Civilisation in the New World, should let it be known peremptorily that she will uphold the policing hand of Britain, now somewhat shaking under her vastly greater load in the Old World, at all hazard and against any other Civilised Power, that from envy or other unholy motive would seek to cripple that constraining hold on the menacing Unregenerate forces of the World!"

Macmillan's Guides. Italy and Sicily. Sixth Edition. 1911. *Price* 10*s. net.* *Palestine and Syria.* Fifth Edition. *Price* 5*s. net.* 1910. London: Macmillan and Co., Limited.

These useful guide-books have already found their public, and the new editions will be cordially welcomed. In the Italian volume, it will be remembered, there is first a series of articles on various general subjects connected with Italy and its art, then a large number of very brief sections on routes, which is followed by an alphabetical list of towns, places of interest, etc. This alphabetical list is very convenient for reference, and it is a great advantage to have the whole of Italy and also Sicily treated, however briefly, within the compass of a single volume. On the other hand, it seems to us that the inexperienced traveller will have some difficulty in arranging his tour, and that some assistance might have been given him in the way of skeleton tours, cross references, etc. We note that in the General Description the disease pellagra is still stated to be due to insanitary conditions and a diet of maize. But it is now practically certain that the disease is fly-borne,

the carrier being a sand-fly, and it is, therefore, analogous to malaria, sleeping sickness, and other insect-carried diseases.

In the Palestine volume the opening of the Haija-Damascus railway, and of the Damascus-Mecca line as far as Ma'an, has introduced considerable changes.

ASIA.

The Holy Land. By Robert Hitchens. Illustrated by Jules Guérin, and with photographs. Hodder and Stoughton, 1910. *Price* 25*s. net.*

Those readers who, with little love of sentiment, desire a severely historical or geographical account of Palestine, will find here but "half a loaf, to an intolerable quantity of sack." There is little geography and less history, though there is much information of such kind as is to be gathered from notes rapidly jotted down on a ten days' journey from north to south of the land. The notes have a sudden, staccato quality, mostly relating to detail, and but loosely connected. The author writes as if he had read no other books on his subject, and had not even tried to unify his own impressions into anything like a complete account, or a definite point of view. Yet they are the impressions of one who knows the East like his own soul, and who has an extraordinary instinct for what is significant. There is nothing fatuous about the detail, such as the wondering tourist is too apt to give. There is an excellent spirit of appreciation, and an unfailing good humour such as is by no means universal in books of Eastern travel.

The religious standpoint is that of untroubled Christian belief. He is free to question traditional sites, but the main facts of the sacred narrative are evidently accepted. Here again, however, one sees the subjectivity and impressionableness of the author's mind, to which the spirit of many diverse creeds successfully appeals. At Damascus he is Mohammedan, at Baalbec and Banias an ancient pagan. A Jewish colony silences the syrinx and fills his heart with the songs of Zion; in Galilee he is in the country of Jesus, and all the old gods are dead; in Jerusalem a Moslem at prayer helps him to realise as never before the meaning of the words "Our Father."

The secret of all this is that the book is from first to last impressionist. He has laid himself open to the magic of the land, and his story is of successive spells cast over him. The imagination dominated by the great stand of columns at Baalbec, the spell of Damascus cast by the desert and the oasis both, the spell of "Jerusalem's amazing complexity"—these are the stages of this journey. Sometimes the impression is exaggerated, as when we read of "the vast plains of Palestine," yet always his eye is on the object, and he selects the *significant* aspect of it. That, indeed, is the characteristic note of this as of *The Garden of Allah.* Like the poet of Valladolid—

> "The cloak . . . had purpose, and the ruff significance."

Whether it be a group of passing camels or a chime of bells, the drowsy languor of the air, or the stir of the city's streets, the note of significance is never absent. Damascus or Jerusalem are "silken garment and hair shirt." Damascus is "a garden city touched by the great desert—under its roses one feels the sands." The rock in the Church of the Holy Sepulchre is "a couchant, gray-brown monster . . . stretched out in a harsh repose." While everywhere, among these ancient splendours, there is that "combination of finery, paint, and dirt, so attractive to an Eastern."

Not unnaturally, in such a book, there is a constant wealth of colour-work, and indeed the temptation to this is great in Palestine. In many cases the use made

of it is striking. The delicate tints of Syrian landscape are very fully appreciated. The Desert of the Dead Sea is "a turmoil of pallors," the paleness of the land is one of its most striking characteristics. The Syrian children—"dull blue or dim rose—rags of genius"—stand out vivid against backgrounds which disclose the "exquisite possibilities of white and gold," or the delicacy of a sea-shell flush. But this sort of work may be overdone, and the lavishness of the colour-work not infrequently wearies the reader.

The book is essentially one of psychic values. Scenery, architecture, everything is described not as it is in itself, but for the impression it makes on the writer's feelings. Every one knows Mr. Hitchens' wonderful power in the delineation of a certain kind of emotional psychology. It would seem as if his genius needs the stimulus of personality in which that particular kind of work may be exhibited. As in the *Jérusalem* of Pierre Loti, the land is but a background for the human drama; but while Loti supplies the drama (such as it is) in his own quest for a faith, the present author is not himself sufficiently moved, and the tragedies of the mighty past are too long ago played out. He has not here any such figures as those whose emotions fix in the reader's mind the scenery of *Barbary Sheep* or *Bella Donna*. Consequently the book fails to impress one as much as one feels it should. The human interest is, however, awakened at the Church of the Holy Sepulchre with its thronging multitudes, and especially at every glimpse of the Russian peasants. And the chapters which describe these are singularly sympathetic and vivid.

The photographs are excellent, and many of them original and new. The coloured pictures are extraordinary. The originality of colour and design, their daring impressionism in which the colour scheme absolutely dominates all considerations of verisimilitude, are startling in the extreme, and yet full of a kind of strange genius. They are not the land as anybody ever saw or will ever see it. They are the land seen in dreams, sometimes with a touch of nightmare.

AFRICA.

Wild und Wilde im Herzen Afrikas. Von Hans Schomburgk. Berlin: Egon Fleischel and Co., 1910. *Price* 8 *marks.*

The youthful author of this sporting book, having served in the Natal Mounted Police and the Barotse Native Police, began in 1906 his extensive journey through Central Africa carrying a hand-camera to which we are indebted for many of the photographic illustrations. He travelled first to the sources of the Kapompo, which falls into the Zambezi about one hundred miles north-west of the Victoria Falls. He afterwards returned there with Captain Hammond Hemming of the East Lancashire Regiment, and then proceeded to the unknown land of the Wa Lundi, Schomburgk's bag for 1906 comprising eighty animals of twenty-one different kinds, including ten elephants. They passed to the land of the Valovale, which is very fertile and rears excellent bananas. Then they went to Lake Bangweolo, Schomburgk shooting a rhinoceros and elephant. Riding on a bicycle, which amused the natives, he reached Fort Rosebery (called Mansa by the natives), which is situated in a densely populated district to the north-west of Lake Bangweolo. The builder of Fort Rosebery also built the memorial to Livingstone at Chitambo to the south of the Lake.

Crossing the frontier, the sportsmen entered German East Africa, and had to undergo at Mueia a rather unpleasant examination. Schomburgk remarks: "We saw at once we had entered German territory. I felt as if, after long years, I had come home. Proudly waved the black-white-and-red flag. The well-known

German words of command rang sharply from a squad being drilled. On every cap was the Imperial eagle. But still, there was the friendly, delightful German countenance of our charming host. Yet German officialdom made itself felt, for, with great formality, our united firearms and cartridge-boxes were sealed and sent before us to Neulangenburg, the capital of the district, which is reached by a splendid broad road from Mueia." He gives a copy of the "Jagd-schein," or hunting permit, which he received on payment of ten rupees, and which forbade the shooting of giraffes, zebras, ostriches, eagles, etc., and made various sums payable when elephants, etc., were killed. Schomburgk mentions that while, in British territory, the giving of spirits to natives is as severely punished as selling it, in German Africa, as far as he saw, it was only the sale that was punished. He and Hemming shot elephant and rhinoceros in the Jiam-Jiam district, and Schomburgk captured a baby elephant which he brought triumphantly to Europe, thus closing a book which will be valued by big-game hunters and by all interested in Unknown Africa.

Ethnology of A-Kamba and other East African Tribes. By C. W. Hobley, C.M.G., A.M. Inst.C.E., East Africa Protectorate Service. Cambridge: At the University Press, 1910. *Price 7s. 6d. net.*

This book is divided into two parts, of which the first is devoted to a discussion of the habits, customs, laws, religion, etc., of the A-Kamba, a Bantu tribe which occupies a considerable area in the East African Protectorate, lying to the south-east of Mt. Kenia. The author has already published a monograph on the *Ethnology of Eastern Uganda*, and the present book is the result of observations made during the year and a half for which he has been responsible for the administration of the A-Kamba. The second part, which relates to the social organisation of the Masai, and the history of the A-Kikuyu, with notes on some other tribes, consists of jottings made by the author during his official journeys among the various tribes of the Protectorate. He is strongly of opinion that successful administration can only be based upon an adequate knowledge of the laws and customs of the races governed, and in his preface he urges the necessity for more ethnological research, by trained observers, among the various races in the British colonies and protectorates. The same recommendation is made by Professor Ridgeway in a prefatory note which he contributes to the volume.

Mr. Hobley's own very careful study is a model of what such investigation should be, and contains a large mass of detailed information. Space does not permit us to quote any of the facts which have emerged from his work, but we may note as of special interest his brief account of the probable early history of the early colonisation of the highlands of British East Africa, and the effect of the invasions of the A-Kikuyu from the south and south-east and of the warlike Masai from the north.

AUSTRALASIA.

Otahiti, au pays de l'éternel Été. Par Henri Lebeau. Paris: Librairie Armand Colin, 1911. *Prix 3 fr. 50.*

The Tahiti group of islands in the Pacific Ocean passed into the hands of the French in 1888; and in this volume we have from the pen of a French traveller an instructive, albeit belated, sketch of the impressions he formed of the islands so long ago as 1906, when he spent six weeks among them. He himself admits that during so brief a period he could not make a serious study of the

people, but he gives us his impressions for what they are worth. They are far from pleasant reading. It is the old story of French colonisation. The country is managed for the benefit of the officials and not in the interests of the people. For a total of some ten thousand inhabitants there are no less than five hundred and ten officials, a figure which M. Lebeau contrasts with the *three* officials who rule the neighbouring British island of Baratonga with its thirty thousand inhabitants: and he adds "Hâtons-nous d'ajouter que la petite colonie anglaise, si sommairement administrée, a une activité commerciale en contraste pénible pour notre amour-propre aver la stagnation économique de sa voisine si luxueusement pourvue d'administration." Moreover, according to M. Lebeau, the islanders have in no way improved either in manners or in morals, and the resident missionaries have had but meagre success in their efforts to spread Christianity. Altogether the picture of the present condition of the inhabitants of these lovely islands —the country of eternal summer—as painted by M. Lebeau is most sombre.

POLAR.

The Toll of the Arctic Seas. By Deltus M. Edwards. New York: Henry Holt and Co., 1910. *Price* $2.50 *net.*

This volume is considerably fuller, and, as a result, more useful to the student of polar endeavour than many ones of a similar nature that have appeared recently. Its chief defect is a lack of a sense of proportion which emphasises too prominently American expeditions, especially if their objective was the "boreal center," to quote an objectionable Americanism which the author employs. Moreover, this is done at the expense of other expeditions quite as worthy of detailed notice. Thus the *Fram* expedition has seven pages, the *Gjöa* and Sverdrup's expedition four each, while Kane and Hayes have sixty pages, Greely fifty-three, and Hall sixty-five. The expeditions of Leigh Smith, which certainly should afford enough thrilling narrative, are little more than mentioned, and the expedition of H.M. ships *Alert* and *Discovery* is not given a page. On the other hand, the author claims to publish for the first time the story of Nindemann of De Long's *Jeannette* expedition and fuller details of the awful experiences of the Greely expedition, in the narrative of Private Frederick, one of the survivors. The account of the Franklin search is full and accurate and does justice to all concerned, a rare feature in popular histories of arctic exploration.

We cannot agree with Mr. Edwards' suggestion that Crocker Land may be an outpost of "another island as large as Greenland." Such a statement could scarcely have been made had he examined carefully our knowledge of the north polar basin. A misprint occurs with regard to the expedition of the *Germania*, which was in 1868, and not the year stated; and in the otherwise satisfactory index a curious error occurs in the name of John Rae. The large folding map, without being a beautiful example of cartography, is yet very useful and detailed, but would bear a few corrections. King James Land, the Muscovy Company's name for Spitsbergen (which Mr. Edwards spells wrongly with a "z"), would be better expunged, and so would such names as Roebuck Land, Nathorst Land, Nordenskjold Land, Andree Land, etc., for parts of that country; indeed, for some of these there is no justification whatever. Walrus Island seems to be a new variant of Sea-Horse Island, whose real name, according to Conway, is Hope Island. The "Summer Hotel" indicated in Advent Bay has ceased to exist as such for some years.

GENERAL.

An Eastern Voyage: A Journal of the Travels of Count Fritz von Hochberg through the British Empire, in the East, and in Japan. Two volumes. London: J. M. Dent and Sons, Ltd., 1910. *Price* 31*s.* 6*d. net.*

We gather from these volumes that Count Fritz von Hochberg had travelled in the East some years before the voyage in 1907 which is the subject matter of his present work. A careful perusal of this book suggests to us that it would have been much better if Count Fritz had stayed at home in 1907, for his account of his travels, except in Japan and perhaps Singapore, indicates that he found almost every place, where he went, miserable and detestable. Leaving England early in October 1907, he reached Freemantle in Australia, and his troubles began at once. "Never (he says), thank goodness, have my eyes seen such a desolate, untidy, miserable country. . . . Everything is covered, smothered with dust, even the sulky-looking people, who stare at one in a bad-mannered, vulgar way." He journeyed on to Adelaide, a "wretched-looking suburban sort of place," where the country when away from the sea "changes into the same monotonous, dried-up, brown, barren-looking tableland, with untidy barbed-wire fences, and half-dead, burned eucalyptus-tree ruins scattered all over the place, and lots of big brown-black stones between." Of Melbourne, he says it is a "straight broad-streeted, uninteresting largish town, somewhat suburban-looking, with a vulgar-looking crowd of people, and overdressed second-class-looking women." The country between Melbourne and Sydney "is the most monotonous, hideous, desolate country I've ever seen." At Sydney, however, he did enjoy a few days at a stud farm, which went far to dissipate his unpleasant impressions of Australia. New Zealand was no improvement. Of "this God-forsaken place," Wellington, he says: "To be named Governor of New Zealand, and to have to reside in Wellington, would be, to my mind, equal to criminal exile to the lead-mines of Siberia." After a short visit to Tasmania he returned to Australia, and thence went to New Guinea and the Philippines, Hongkong, and Macao, "a most disappointing place." Singapore, however, was charming, and the jungle in the Straits Settlement magnificent. He reached Burma in the end of February 1908, and of Rangoon he tells us, "Well, upon my word, I've never seen a dirtier, dustier, untidier, uglier place than this blessed Rangoon. . . . The people are the scum of India, wretched, awful-looking, thin, dirty Indians. And the natives! They are an ugly caricature of the Japs in grotesque clothes, if one can call their garments clothes." Of Burma, generally, he says, "several weeks in Burma would be enough to kill me." Crossing over to Calcutta, he made his way to Cashmere, visiting Agra on his way. Of the matchless Taj he says, "Certainly it is very fine, there's no doubt about it, and very impressive, but architecturally I don't admire it so very much. The cupola somehow seems wrong, and the straight, plain, square middle structure is to my mind wanting in relief, giving no lights and shadows. Then the minarets are not high enough for the central edifice . . . the proportions not good . . . but it is a very beautiful thing." By the middle of April he reached Srinagar, the famous capital of Cashmere, and found it "by no means a pretty or attractive place, with stinky, dusty, rough streets where chickens, mangy dogs, and disgustingly dirty, seedy-looking people and children abound." Of the climate of Cashmere he says: "I find it a beastly climate, and everybody who complains about our European climate ought to be brought to Cashmere for some time: he would give up grumbling then." But we need not continue further the doleful itinerary. Everything was changed when the Count got to Japan. Here he was welcomed and fêted by old friends and

enjoyed himself to his heart's content. His diversions were various. He had several offers of marriage; he assisted in shaving geishas and they assisted in shaving him; he was shown all sorts of treasures of art which are usually concealed from foreigners: he visited innumerable temples and made numerous sketches, and if the illustrations of these two volumes are his work, many of them are certainly very good. He is a whole-hearted Japophil and almost exhausts his vocabulary in his expressions of admiration for them. Count Fritz has, it must be confessed, no small opinion of himself. He tells us, "I might get quite conceited with all the vivid interest that is shown everywhere in me, high and low, in all countries and by all nationalities, kindly occupying themselves with my uninteresting personality, and with what I do and mostly *don't do*, but I am totally indifferent to what other people do or say." His mature opinions of men and manners are very amusing. Here is one on Americans. "For me the Americans are the most unpleasant nation; and the dialect and the expressions they use! . . . No American can ever be a lady, even if she gives herself the airs of one." Next for the Englishwoman. "She *always*, and *under all circumstances*, regards herself as the specially elected tool of a higher wisdom to pioneer and educate and convert a country and its customs and its people. I don't mean to convert to Christianity, I mean . . . she is going to teach, to enlighten its people, to show them the proper way of life, and *everything* in this wretched country (Japan) is judged stupid, etc., etc., according to her plum-pudding ideas." Here we leave Count Fritz, who has happily come to the wise conclusion that he "has seen too much of the world"; decidedly he should now stay at his ancestral home at Halban, or settle down in Japan, where perhaps he may find people to take him at his own valuation.

Finnish Self-Taught (Thimm's System), with Phonetic Pronunciation. Marlborough's Self-taught Series. By Agnes Renfors. London: E. Marlborough and Co., 1910. *Price* 1s. 6d.

We are glad to see the addition of this volume to the Self-taught series. It should prove very useful to travellers in Finland, and like other members of the series gives information in regard to the coinage, etc., as well as providing for all the probable wants of the visitor to the country.

The Nations of the Modern World. Mackinder's Geographical Series. By H. J. Mackinder, M.A. London: Geo. Philip and Son, 1911. *Price* 2s.

This is the fourth and concluding number of a series whose other volumes have already been reviewed here. It may best be described as a short historical survey of the great nations of the world, and of world politics at the present day. The origin of existing conditions is described, and the effect of the geographical factors on the course of history is emphasised. The book is very copiously illustrated, both by maps and views, though the relation of the latter to the text is not very close, nor has sufficient care always been taken with the lettering. Thus we note an illustration entitled "Flax in New Zealand," but the plant figured is apparently the so-called New Zealand flax or Phormium, which has no relation whatever to the true flax plant.

From the geographical standpoint the book has many interesting little touches which the teacher will find useful and stimulating, but the historical portion seems to us to lack breadth of view and imagination. When we think of all that the French Revolution meant to Europe, and the intensity of emotion which it aroused throughout the civilised world, it is difficult not to feel that the school-

boy who is told that "the men who made the Revolution meant well, but they lacked the long schooling of experience which had been undergone by the English and Dutch," is being robbed of his legitimate share in a great human experience. Is it thus that he is most easily lead to read the works of the giants of the period for himself, or even to appreciate the meaning of what some people regard as the greatest event in the history of the world?

BOOKS RECEIVED.

The Danube with Pen and Pencil. By Captain B. Granville Baker. With 99 Illustrations. Cr. 4to. Pp. xvi + 191. *Price* 15*s.* London: Swan Sonnenschein and Co., Ltd., 1911.

Spindrift and Sand-Drift: being a Trip to South Africa. By Marshall N. Gould. Cr. 8vo. Pp. viii + 248. *Price* 3*s.* 6*d.* London: George Allen and Sons, 1911.

The Roman Wall in Scotland. By George Macdonald, M.A., LL.D., Honorary Curator of the Hunterian Coin Cabinet, University of Glasgow. With Map, Plan, and Numerous Illustrations. Demy 8vo. Pp. xvi + 413. *Price* 14*s. net.* Glasgow: James Maclehose, 1911.

The Nāga Tribes of Manipur. By T. C. Hodson. Demy 8vo. Pp. xiv + 212. *Price* 8*s.* 6*d. net.* London: Macmillan and Co., Ltd., 1911.

Reise durch das Hinterland von Liberia im Winter 1906-1907. Von Dr. Walter Volz. Demy 8vo. Pp. 168. *Preis* M. 4·50. Bern: A. Francke, 1911.

My Life among the Bluejackets. By Agnes Weston. Sixth Impression. Cr. 8vo. Pp. xv + 329. *Price* 6*s. net.* London: James Nisbet and Co., Ltd., 1911.

Wild und Wilde im Herzen Afrikas. Von Hans Schomburgk. Demy 8vo. Pp. xvi + 373. *Preis* M. 8. Berlin: Egon Fleischel and Co., 1911.

The Eastern Alps, including the Bavarian Highlands, Tyrol, Salzburg, Upper and Lower Austria, Styria, Carinthia, and Carniola. Handbook for Travellers. By Karl Baedeker. With 73 Maps, 16 Plans, and 11 Panoramas. Twelfth Edition. Revised and Augmented. Small Cr. 8vo. Pp. xxviii + 682. *Price* 10*s. net.* Leipzig: Karl Baedeker, 1911.

Polar Exploration. By Dr. W. S. Bruce, LL.D., F.R.S.E. With Maps. Cr. 12mo. Pp. 256. *Price* 1*s. net.* London: Williams and Norgate, 1911.

Modern Geography. By Marion I. Newbigin, D.Sc. (Lond.) Cr. 12mo. Pp. 256. *Price* 1*s. net.* London: Williams and Norgate, 1911.

Berkshire (*Cambridge County Geographies*). By H. W. Monckton, F.L.S., F.G.S. With Maps, Diagrams, and Illustrations. Cr. 8vo. Pp. x + 168. *Price* 1*s.* 6*d. net.* Cambridge: University Press, 1911.

The Place-Names of Berkshire. By the Rev. Walter W. Skeat, Litt.D., D.C.L., LL.D., Ph.D., F.R.A. 12mo. Pp. 118. *Price* 2*s. net.* Oxford: Clarendon Press, 1911.

The Land of Burns: Mauchline Town and District. By J. Taylor Gibb. Demy 8vo. Pp. 96. *Price* 1*s.* 6*d. net.* Glasgow: Carson and Nicol, 1911.

Les Derniers Barbares, Chine, Tibet, Mongolie. Par Le Commandant D'Ollone. Fourth Edition. Royal 4to. Pp. v + 371. *Prix* 15 *francs.* Paris: Pierre Lafitte et Cie, 1911.

An Eastern Miscellany. By the Earl of Ronaldshay, M.P. Demy 8vo. Pp. xiv + 422. *Price* 10*s.* 6*d. net.* London: William Blackwood and Sons, 1911.

Hints on Outfit for Travellers in Tropical Countries. By Charles Forbes Harford, M.A., M.D. Second Edition. 12mo. Pp. 66. London: Royal Geographical Society, 1911.

Europe: a Scientific Geography. Book III. By Ellis W. Heaton, B.Sc., F.G.S. Cr. 8vo. Pp. 149. *Price* 1*s.* 6*d. net.* London: Ralph Holland and Co., 1911.

Changing China. By the Rev. Lord Wm. Gascoyne-Cecil, assisted by Lady Florence Cecil. Fourth Impression. Demy 8vo. Pp. vii + 342. *Price* 3*s.* 6*d.* London: John Nisbet and Co., Ltd., 1911.

The Golden Land: The True Story and Experiences of British Settlers in Canada. By Arthur E. Copping. With 24 Illustrations in Colour by Harrold Copping. Demy 8vo. Pp. xvi + 263. *Price* 6*s.* London: Hodder and Stoughton, 1911.

The Mediterranean: Seaports and Sea Routes, including Madeira, the Canary Islands, the Coast of Morocco, Algeria, and Tunisia. Handbook for Travellers. By Karl Baedeker. With 38 Maps and 49 Plans. Cr. 8vo. Pp. xxxv + 607. *Price* 12*s.* Leipzig: Karl Baedeker, 1911.

Highroads of Geography. The Royal School Series. 4to. Book I. Pp. 128. *Price* 10*d.*; Book II. Pp. 174. *Price* 1*s.* Edinburgh: T. Nelson and Sons, 1911.

Détermination de L'Altitude du Mont Huascaran (Andes du Pérou). Exécutée en 1909 sur la demande de Madame F. Bullock-Workman par la Société Générale d'Études et de Travaux Topographiques. Royal 4to. Pp. 50. Paris: Henry Barrère, 1911.

The Home of Man. (The New Outlook Geography.) Pt. I. The British Isles. By W. C. Brown, M.A., F.C.P., and P. H. Johnson, B.A., L.C.P. Cr. 8vo. Pp. 343. *Price* 2*s.* 6*d.* London: George G. Harrap and Co., 1911.

Roma e Dintorni. Guida Speciale con Pianta della Città e Carta dei Dintorni. *Prezzo* L. 1·50. Novara: Istituto Geografico de Agostini, 1911.

Sinai in Spring: or, The Best Desert in the World. By M. J. Rendall. Illustrated from Photographs by the Author. Cr. 8vo. Pp. xii + 167. *Price* 4*s.* 6*d. net.* London: J. M. Dent and Sons, Ltd., 1911.

The Danger Zone of Europe: Changes and Problems in the Near East. By H. Charles Woods, F.R.G.S. With 3 Maps and 52 Illustrations. Demy 8vo. Pp. 328. *Price* 10*s.* 6*d. net.* London: T. Fisher Unwin, 1911.

The Russian Year-Book for 1911. Compiled and Edited by Howard P. Kennard, M.D. With an Introduction by Baron Alphonse Heyking. Cr. 8vo. Pp. xv + 387. *Price* 10*s.* 6*d. net.* London: Eyre and Spottiswoode, Ltd., 1911.

La Grande Artère de la Chine, Le Yangtseu. Par Joseph Dautremer. Demy 8vo. Pp. 304. *Prix* 6 *francs.* Paris: E. Guilmoto, 1911.

Adventure, Sport, and Travel on the Tibetan Steppes. By W. N. Fergusson, F.R.G.S. With Illustrations from Photographs by the Author and the late Lieut. Brooke, and Two Maps. Royal 8vo. Pp. xvi + 343. *Price* 16*s. net.* London: Constable and Co., 1911.

The Making of Scotland. Lectures on the War of Independence delivered in the University of Glasgow. By the Right Hon. Sir Herbert Maxwell, Bart., F.R.S., LL.D. (Glasgow), D.C.L. (Durham). Cr. 8vo. Pp. x + 241. *Price* 5*s. net.* Glasgow: James MacLehose and Sons, 1911.

Half-a-Century in China: Recollections and Observations. By the Venerable Arthur Evans Moule, B.D. With Illustrations and Map. Demy 8vo. Pp. xii + 343. *Price* 7*s.* 6*d. net.* London: Hodder and Stoughton, 1911.

English and Italian Military Terms. By Capitano A. Caiani. Cr. 8vo. Pp. 134. Roma: Istituto Geografico de Agostini e Cia, 1907.

Old Ross-shire and Scotland, as seen in the Tain and Balnagown Documents. Supplementary Volume. By W. Macgill, B.A. (Lond.). Demy 8vo. Pp. vii. + 145. *Price* 7*s.* 6*d.* Inverness: The Northern Counties Newspaper and Printing and Publishing Co., Ltd., 1911.

Victorian Year Book, 1909-10. By A. M. Laughton, F.I.A., F.F.A., F.S.S. Thirtieth Issue. Melbourne, 1911.

Handbook of American Indians North of Mexico. In Two Parts. Part 2. Edited by Frederick Webb Hodge (Smithsonian Institution). Washington, 1910.

The Rocks of Hunstanton and its Neighbourhood. By J. F. Jackson. Pp. 54. *Price* 6*d.* London: Primer Press, 1911.

Notes on the Orographical Map of Europe. By A. W. Andrews, F.R.G.S., and B. B. Dickson, F.R.G.S. Pp. 30. London: Macmillan and Co., Ltd., 1908.

Statistical Abstract for the British Empire in each Year. From 1895 to 1909. Seventh Number. London, 1911.

Report of a Conference on the Teaching of Geography in London Elementary Schools. Demy 8vo. Pp. 80. *Price* 1*s.* London: London County Council, 1911.

The Movements of the Subsoil Water in Upper Egypt. (Survey Department, Egypt.) By H. F. Ferrar, M.A., F.G.S. Demy 8vo. Pp. vi + 74. *Price* 150 *millièmes.* Cairo, 1911.

Diplomatic and Consular Reports.—Trade of Chumpann, 1909, and part of 1910 (4623); Trade of Goa, 1909-10 (4625); Finances of the German Empire (4626); Trade of Germany, 1910 (4627); Trade and Commerce of Guatemala 1909 (4628).

Colonial Reports (Miscellaneous).—The Imperial Department of Agriculture in the West Indies (75); Report on the Results of the Mineral Survey, 1907-8—Southern Nigeria (76).

Colonial Reports (Annual).—Report for Leeward Islands, 1909-10 (673).

Publishers forwarding books for review will greatly oblige by marking the **price** *in clear figures, especially in the case of foreign books.*

NEW MAPS AND ATLASES.

EUROPE.

ORDNANCE SURVEY OF SCOTLAND.—The following publications were issued from 1st to 31st January 1911:—

Six-inch and Larger Scale Maps.—Six-inch Maps (Revised). Quarter Sheets, with contours in blue. Price 1s. each. *Ayrshire.*—18 SW.; 30 SE. With contours in Black. Price 1s. each.—*Ayrshire.*—38 SE.

1:2500 Scale Maps (Revised), with Houses stippled, and with Areas. Price 3s. each. *Lanarkshire.*—Sheets xxxi. 9, 10, 11, 13, 14, 15, 16; xxxii. 13, 14, 15; xxxvii. 2, 3; xxxviii. 1, 2, 3, 7, 8.

Note.—There are no coloured editions of these Sheets, and the unrevised impressions have been withdrawn from sale.

ORDNANCE SURVEY OF SCOTLAND.—The following publications were issued from 1st to 28th February 1911:—

One-inch Map (third edition, engraved, in outline). Sheets 58, 68, 69, 78, 88. Price 1s. 6d. each.

Six-inch and Larger Scale Maps.—Six-inch Maps (Revised). Quarter Sheets, with contours in blue. Price 1s. each. *Ayrshire.*—30 SW.; 33 NE.; 35 SW. With contours in black. Price 1s. each. *Ayrshire.*—40 SW.; 40 SE.; 41 NW.;

41 SW. ; 42 NE. ; 42 SW. ; 45 NW. ; 46 NW. ; 46 SE. ; 50 NE. ; 52 NE. *Peeblesshire.*—23 NW. ; 23 SW. ; 25 NW.

1 : 2500 Scale Maps (Revised), with Houses stippled, and with Areas. Price 3s. each. *Lanarkshire.*—Sheets XXX. 7, 11 ; XXXI. 6 ; XXXII. 12, 16 ; XXXIII. 6, 7, 8, 10, 11, 12, 13, 14, 15 ; XXXIV. 9 ; XXXVIII. 4 ; XXXIX. 1, 3, 4, 5 ; XL. 1. Sheets too open for publication on 1 : 2500 Scale. *Lanarkshire.*—Sheets XIV. (10 and 9), 11.

Note.—There are no coloured editions of these Sheets, and the unrevised impressions have been withdrawn from sale.

ORDNANCE SURVEY OF SCOTLAND.—The following publications were issued from 1st to 31st March 1911 :—

Two-mile Map, printed in colours, and Hills shown by layers, folded in cover or flat in sheets. Sheets 17, 18, 19, 20, 21, 22, 23. Price—on paper 1s. 6d. ; mounted on linen 2s. ; mounted in sections 2s. 6d. each.

One-inch Map (third edition, engraved, in outline. Sheets 59, 79, 89 ; Price 1s. 6d. each. Third edition, engraved, with Hills in brown or black. Sheets 58, 68, 69, 78, 88 ; Price 1s. 6d. each. Third edition, printed in colours and folded in cover, or flat in sheets. *Lochinver.*—Sheet 107 ; *Altnaharra*, Sheet 108 ; *Cape Wrath*, Sheet 113 ; *Tongue*, Sheet 114. Price—on paper 1s. 6d. ; mounted on linen 2s. ; mounted in sections, 2s. 6d. each.

Diagrams—County.—Scale four miles to one inch, showing civil parishes, with a table of their areas. *Kirkcudbrightshire.*—Price 6d.

Six-inch and Larger Scale Maps.—Six-inch Maps (Revised). Quarter sheets, with contours in blue. Price 1s. each. *Ayrshire.*—11 NW. ; 11 SW. ; 12 SW. ; 15 NE. ; 17 NE. ; 18 NW. ; 18 NE. ; 18 SE. ; 19 SW. ; 23 NE. ; 24 NW. ; 27 NW. ; 27 SE. ; 28 NW. ; 28 NE. ; 28 SW. ; 29 SW. ; 30 NE. ; 34 NW. ; 36 N.W. ; 36 SE. With contours in black. Price 1s. each. *Ayrshire.*—42A NW.

1 : 2500 Scale Maps (Revised), with Houses stippled, and with Areas. Price 3s. each. *Lanarkshire.*—Sheets XXIII. 15 ; XXVI. 16 ; XXVII. 13 ; XXIX. 16 ; XXX. 5, 6, 9, 13, 14 ; XXXI. 5, 8, 12 ; XXXII. 6, 8, 10 ; XXXIII. 4, 5, 9, 16 ; XXXIV. 1, 5, 13 ; XXXV. 4 ; XXXVI. 1 ; XXXIX. 2, 6. Sheets XXIX. 7, 11. Price 1s. 6d. each.

Note.—There are no coloured editions of these Sheets, and the unrevised impressions have been withdrawn from sale.

GEOLOGICAL SURVEY OF SCOTLAND.—The following publications were issued from 1st to 31st January 1911 :—

Memoirs of the Geological Survey. Catalogue of Photographs of Geological Subjects. Series B. 1—676, whole plate ; Series C. 1—1237, half plate. Prepared by the Geological Survey and Museum. Price 6d.

CAMPAGNA ROMANA.—Carta topografica. Scale 1 : 250,000 or about 4 miles to an inch. Price L. 0·50. *Istituto Geografico de Agostini, Novara.*

A pretty little map of the Environs of Rome, which should be useful to tourists.

TORINO.—Pianta-Guida con Indicazioni Pratiche. 1911. Scale 1 : 10,000 Price L. 1. *Istituto Geografico de Agostini, Novara.*

A well executed plan and guide to the city of Turin.

RUSSIA IN EUROPE.—Carte de Russie d'Europe en seize feuilles à l'échelle de 1 : 2,000,000. Tirée de l'Atlas de A. F. Marcks, commencée par le professeur E. Petri, et publiée par J. de Schokalsky, Président de la Section de Géographie Physique à la Société Impériale Russe de Géographie, Membre

correspondant honoraire des Sociétés de Géographie, de Londres, d'Ecosse, de Berlin, etc. 1910.

Institut Cartographique de A. F. Marcks, St. Pétersbourg.

This is quite the best and most complete general map of Russia yet published. Edited by General J. de Schokalsky, President of the Physical Section of the Imperial Geographical Society of Russia, an authority so well known to all European geographers, we look for a high standard of excellence, which is fully realised in this beautiful and elaborate map. Unfortunately for the English reader it is printed in Russian lettering.

TURKEY.—General Staff Map on scale of 1 : 250,000 or about 4 miles to an inch. 1910. Sheet—Kirjali. Price 2s. 6d.

Geographical Section, General Staff, London.

AFRICA.

EAST AFRICA PROTECTORATE.—Scale 1 : 125,000 or about 2 miles to an inch. Surveyed under the direction of the Director of Surveys, East Africa Protectorate. Drawn at the War Office. 1911. Mangea Sheet and Takaungu Sheet. Price 2s. each net.

Geographical Section, General Staff, London.

NORTHERN NIGERIA.—Scale 1 : 250,000 or about 4 miles to an inch. Drawn at the War Office and reproduced at the Ordnance Survey Office. 1911. Sheets—Bebey, Daura, Demagerim, Dengi, Gando, Gashegeur, Geidam, Gubio, Gumel, Isa, Kano North, Katagum, Katsina, Kaura, Kukawa, Machinna, Manga, Maradi, Matankari, Sokoto, Yo. Price 1s. 6d. net each sheet.

Geographical Section, General Staff, London.

ASIA.

INDIA.—Series of Index Maps to the Degree and Standard Sheets of the Survey of India and Adjacent Countries. Forty-six Maps.

Survey of India Office, Calcutta

These Index Maps show the sheets published in the new and old styles from the new and old surveys.

INDIA.—Index to the Indian Atlas on the scale of 4 miles to an inch. Showing sheets that have been published up to 1st October 1909.

Survey of India Office, Calcutta.

AMERICA.

ONTARIO.—Topographic Map. Scale 1 : 63,360 or 1 mile to an inch. Sheet No. 36, Port Stanley (Department of Militia and Defence, Ottawa, 1910).

Geographical Section, General Staff, London.

QUEBEC.—Topographic Map. Scale 1 : 63,360 or 1 mile to an inch. Sheet No. 26, St. John's (Department of Militia and Defence, Ottawa, 1909).

Geographical Section, General Staff, London.

UNITED STATES.—Relief Map. Scale 1 : 10,000,000. Compiled by Henry Gannett. New Edition. 1910.

United States Geological Survey, Washington, D.C.

UNITED STATES.—General Map in three sheets. Scale 1 : 2,500,000 or about 40 miles to an inch. New Edition. 1910.

United States Geological Survey, Washington, D.C.

UNITED STATES.—Topographic and Geologic Index Map. Showing progress in Surveying and Engraving Topographic Maps and Publishing Geologic Folios to January 1911. In three sheets. Scale 1 : 2,500,000 or about 40 miles to an inch. *United States Geological Survey, Washington, D.C.*

This interesting and useful map shows the exact state of the United States Survey at the present date. It shows the areas surveyed, but maps not yet engraved; areas surveyed with maps engraved and published; areas surveyed with Geologic Folios in course of publication; and areas surveyed with maps engraved and Geologic Folios published.

UNITED STATES.—Topographic Sheets on scale of 1 : 31,680 or about 2 inches to a mile. 1910. Price 5 cents each sheet. The figures after the name of each State indicate the number of sheets received. California, 18; Louisiana, 1; Mississippi, 4.

Topographic Sheets on scale of 1 : 62,500 or about 1 mile to an inch. 1910. Alabama, 1; Arizona, 2; Illinois, 4; Indiana, 1; Kansas, 1; Kentucky, 1; Maryland, 1; Michigan, 1; Missouri, 2; New York, 3; Ohio, 4; Oregon, 1; Pennsylvania, 4; Texas, 1; West Virginia, 4; Wisconsin, 1; Wyoming, 1.

Topographic Sheets on scale of 1 : 125,000 or about 2 miles to an inch. Colorado, 6; Oklahoma, 1; Texas, 1; Washington, 1; and Yellowstone National Park.

Topographic Sheets on scale of 1 : 250,000 or about 4 miles to an inch. California, 2; Nevada, 1; Utah, 1.

United States Geological Survey, Washington, D.C.

ATLASES.

ATLAS OF ZOOGEOGRAPHY.—Bartholomew's Physical Atlas, vol. v. A series of Maps illustrating the Distribution of over Seven Hundred Families, Genera and Species of Existing Animals. Prepared by J. G. Bartholomew, LL.D., F.R.S.E.; W. Eagle Clarke, F.R.S.E., F.L.S.; and Percy A. Grimshaw, F.R.S.E., F.E.S. Issued under the Patronage of the Royal Geographical Society. 1911. Price £2, 12s. 6d. net. *John Bartholomew and Co., Edinburgh.*

This atlas is reviewed on page 200.

A STAR ATLAS AND TELESCOPIC HANDBOOK.—(Epoch 1920.) For Students and Amateurs. Covering the whole Star Sphere, and showing over Seven Thousand Stars, Nebulæ and Clusters. With Notes on Planets, Star Nomenclature, etc. By Arthur P. Norton, B.A. 1910. Price 5s. *Gall and Inglis, London and Edinburgh.*

A most useful astronomical atlas, with a practical handbook, which should prove of great value to all students. The atlas consists of sixteen clear and distinct maps with two index plates. The text contains tables, notes on astronomical terms, and hints on observing and the care and use of the telescope, specially intended for the guidance of amateur astronomers.

ATLANTE GEOGRAFICO MUTO. — Fisico-politico a colori. Twenty-five Maps. 1911. Price L. 2·25. *Istituto Geografico de Agostini, Novara.*

An excellent series of coloured physical outline maps. The political boundaries are shown in red lines, but no town marks are indicated. Sea depths are shown by shades of blue.

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

NOTES ON CHANGES IN THE HIGHLAND DISTRICT OF APPIN ON TAYSIDE.

By John Stewart, Junior, Tegarmuchd, by Aberfeldy.

As Dr. Watson remarked, this is a district where the two languages meet, and this also means the meeting and mingling of the two races. That undisputed fact has had its influence on more things than the language, *i.e.* the mixture of Gaelic and English "as she is spoke" in Appin-na-dhu. The people have become somewhat different in various ways from those in the extreme north and west and in the islands. In these parts what might be termed modern conditions have prevailed more or less during the period of time embraced by the longest life. Hence these notes cannot be specially interesting, on antiquarian grounds, though certainly within a century or so there have been changes, striking enough, such as the passing away of primitive customs and methods, the gradual obliteration of old landmarks, and so on, which it may perhaps be worth while to jot down.

The first point to be noted, then, is that we have been lying for so long beside the southern civilisation, the second is that owing to my circumstances and the work in which I am engaged, I am personally acquainted only with a small extent of the country. These two facts must be borne in mind while perusing the following jottings, which refer only to what has come within the knowledge and observation of my father and myself.

Changes in the Surface of the Land.

The late Dr. James Robertson of Canada West, the village of Dull's most eminent son, whose biography has been written by "Ralph Connor," says in a letter to the late Mr. M'Naughton, his old schoolmaster, on the

occasion of his visit to the Old Country after an absence of more than forty years: ". . . I anticipate no small pleasure in my intended visit to renew acquaintance with scenes once familiar. Rivers and roads, hills and woods continue the same, although familiar faces have disappeared and new ones have taken their place. . . ." That is the general feeling. The natural features change far more slowly than the inhabitants; indeed, the land surface changes are so very gradual in their operation as practically to escape notice in an ordinary lifetime. Woods, however, have their term like individuals, though they may stand—if allowed to stand—for generations. Planted about one hundred and thirty years ago, the old fir wood of Dull, which to many besides James Robertson seemed a permanent element of the landscape, has now disappeared except a clump of trees left as a monument on the extreme top. And apart even from afforestation, if we were to take in our survey rather more than a century, we should find that the scene presented us is different in several points from what appeared to our grandfathers and great-grandfathers.

The small part of the Tay Valley under review, like Cæsar's Gaul, may be divided into three parts. It is a simple and clear because a natural division. The locality is bounded on the south by the Tay, and on the north by a small rocky serrated mountain ridge of 1700 feet or so in height, the natural boundary or watershed between Appin and a section of the Strath-Tummel country called Foss. Within this area there are the following three zones of land:—

(1) The arable land, mostly below the road;
(2) The rough pasture and plantations, which extend from the area of cultivation up to the dyke that forms the south boundary of the moor;
(3) The moor, stretching upward and northward to the watershed mentioned.

The tilled ground below or south of the public way we call "dall" (dale in all likelihood), hence the place-name Dalrawer, the farm nearest the river. English-speaking folk hereabout term the "dall" haugh. The second zone, strewn so plentifully in all directions with boulders, we name the "brae" or "braes," meaning the "upper ground"—it is above the tillage. The third, the highest or heather zone, we call "mon" (corresponding to the Latin "mons"). It may be added that locally the word hill or hill-side is never applied to the braes, it is restricted to the moor.

Perhaps it may now be of some little interest to indicate briefly the surface changes that have occurred in my father's or grandfather's time.

As far back as the oldest inhabitant remembers, the tilled ground has almost touched the river banks. But it was not always so. In my grandfather's early days, the lower half of the haugh, the part next the Tay, was waste land, a sort of jungle overgrown with bushes so tall that cattle could not be seen in them. At Camserney, all broom, at other places, such as Tegarmuchd, it was all whin. At that time the braes too were covered to a great extent with broom and whin, and, curiously enough, where there was a broom brae up, there was a corresponding broom land down at the river, and similarly with the whin. To

the present day, the river-side land of Camserney is known as the "broom-haugh," a century after the broom has gone.

Incidents such as the disappearance of rye from our midst (there was a Rye-Knoll, as we learn from Timothy Pont), which took place in my father's time, will come in under "agricultural changes."

Except where it is wooded, the second or central zone is of no particular value either from the standpoint of sport or from that of agriculture. Overrun with brake, it is worthless as grazing, and though it is full of rabbits, rabbit-catching is not the sportsman's favourite pastime.

And here a strange phenomenon meets us. As may be understood from the foregoing, the braes, excluding green patches here and there, were covered, within my father's recollection, with broom—and with broom too of such rank growth as obtained on the haugh in my grandfather's time, *i.e.* such as could conceal farm animals. It has been said that when in full bloom it presented a picturesque scene, one brilliant blaze of yellow spread over a part of the countryside—a natural flower garden on a gigantic scale. King Broom had a long and glorious reign, but, like every reign, however long, it had to come to an end. Decay set in, almost imperceptibly at first; the plants gradually rotted away. The ground was not vacant any length of time when ferns sprang up in all directions, increasing the boundaries of their empire every year, and at last encroaching on land never threatened by them before. Down they come close to the tillage belt, up they go to the moor among the heather. The bracken crop is such a serious nuisance that lairds and others start cutting it when it is young, when "in the curl." This is the only method of extirpation, but it means work and expense—work that would not be done and expense that would not be incurred were it not that the grouse territory is threatened. On the lower part of the moor, in the struggle for existence, the bracken chokes even the heather, unless checked, just as it obliterates the grass on the braes. It changes and spoils the scenery. We have now great stretches of the rising ground above us, a mass of living green no doubt in summer, but—so little of it is mown—a dirty, rust-coloured scene for the greater part of the year. Such then is the territorial influence of King Brake. My father has lived in the two reigns.

A word or two may also be said regarding changes so far back that nobody here can tell even approximately when they took place. If at one time the tillage did not extend to the river, at some remote period there were dwellings and small hamlets and patches of cultivated land on the braes—up almost to the moor-dyke. These ancient "larachs" can easily be detected in several places. On the braes of Camserney—divided into an upper and lower brae by a rivulet (Alt-mack) running SE. into Camserney Burn—there were evidently two distinct settlements at least, one in each quarter of the brae. Beside the lower "larachs" is a spot of ground, still green, known as the "mill-croft." In addition to the sites of several small abodes there is the larach of a much larger one, which possibly may have been a fort or an ecclesiastical institution. On the very highest point of the brae, called Tom-

Tigh-More (the knoll of the big house), there must certainly have been some house, the remains are so much in evidence. There were many others also clustering round the foot of that knoll. But as for the "big house," why, if measured, it would be seen from the stance that it must have been much smaller than the smallest pauper's house standing to-day in the parish. These larachs greatly interested and puzzled me from my boyhood. I could never learn anything from my father or any one else about them. Doubtless, the vale of Appin those rude forefathers looked on differed in various ways from what it is to-day. Clearly those habitations vanished long since, but it does not necessarily follow that they were older than our present-day lower hamlets. They probably co-existed with them. Where the farmsteads, etc., are now, older houses have been always slowly superseded by newer ones (unlike the ancient dwellings on the braes). At Camserney, within recent years, slated houses were erected near an old thatched steading bearing the date 1710. The 1710 erections took the place of older and smaller ones, and so on, backward. The point here is that the 1710 houses were certainly more commodious, and consequently more recent than the ancient sites on the banks and braes.

Curiously enough, perhaps, it would seem that the larachs in Moan, above the braes of Camserney and so nearer the moor, are the most recent of the kind, and were inhabited at a more recent time than the others, as in my father's young days there lingered in the district a dim tradition regarding them. For example, there was a traditional story of the Wedding of the Doan in the Balmore (Big Town) of Moan. Who or what the Doan was, or what the word means we could never make out.

The foregoing remarks apply more particularly to the part of the parish between Camserney Burn and Keltney Burn, the western boundary. The east of Camserney Burn has one distinguishing feature of its own. On the braes above the land of Balhomais, etc., in the "Aird" (or high) district, far up, and close beside the moor plantations, are four farms of some extent, to one of which, Lurgan, half the hill-grazing is attached.

The heather section, the third and highest, is, in a way, as different from the second as the second is from the first—more so indeed so far as the nature of the soil makes a difference. In the two lower divisions the land is red or reddish, above it is almost all black moorland. Along its southern side runs a good stone dyke, forming the boundary of the hill-grazing, at almost the exact altitude and kind of soil above which the heather blooms. Below this it fails to obtain a footing.

Not the least interesting, perhaps, this region has altered in appearance least of the three. Broadly speaking, as it looks at present, so it looked centuries ago, when both brae and haughland wore a different aspect from what they do now. But even it has had its surface changes. Within the memory of the oldest inhabitant this hill, at any rate, was greener, less heathery; better as a grazing, though probably not so good as a grouse moor. For a century or so the heather in its own domain has been gaining, like the brackens beside it. All the same, the heather

is not a nuisance; there can be no burning of brake (to stop its career, that is), but the heather can be set on fire.

In my grandfather's earliest days, the conditions obtaining on the moor differed from the present in another way. It was not used merely for sheep-grazing: cattle and horses as well grazed on it in summer, and instead of being in the hands of a few upland farmers, it was common to the district. The low-ground tenants even had a share in it. The result was that, when the cattle, etc., were sent up to the hill, they could not be taken in at night, as being so far away. Hence the herds and persons looking after them had to stay near at hand over-night. For shelter, small huts or bothies were erected at various points on the moor. It is noteworthy that the same custom is prevalent in Switzerland. Of course, with the advent of winter, these temporary erections had to be abandoned, and all descended to the regular homesteads in the Strath. For such a hill-abode the Gaelic name was "righ" or "ri" (pronounced "ree"), in some quarters perhaps "ruigh" or "rui." Scotstoun, in the hills above Aberfeldy, is in Gaelic "Righ-na-scotach," the Scot's "ree." So too Amulree, which, however, locally is called "Amulrui." These shealings must formerly have been common all over the district, as among the names for places on our own moor, "ree" this and that has survived. At one place the name is given to a knoll, at another to a moss—for all the knolls and mosses had their names—but it would seem as if a knowledge of these names is being lost by the rising generation. For this there are probably several reasons; for one thing the people and the hill do not bear the same intimate relation to each other as they did, say, in the beginning of the nineteenth century. This may be readily understood when we begin to treat of "peats." The discontinuance of peat-casting is—as affecting the human inhabitants—the greatest hill change of modern times.

The hill, then, instead of being a solitude, was for two or three months the scene of a great deal of the life and work, alike of farmers, and their folk, and cottars. They commenced peat-cutting invariably at the same time, and went up and returned in bands together. The nation was then in its childhood, they say, and people were easily amused. Often did the rocks resound, so hearty was the shouting and laughter. It was hard work, but they were jolly over it. Two rests broke the monotony of the day's labour, one a long interval, during which the party assembled on various spots and indulged in play. Sometimes a couple would be put through the wedding ceremony, a "rantin" farmer acting as minister. The old saying, that in the Highlands, at peat-making time, there was a suspension of the moral law for a fortnight, is far too pointed. None the less, it may be admitted that a little latitude was allowed.

We used to cut some peats at Camserney within my own recollection, but the cutting was trifling compared with the extensive scale on which operations were conducted generations before. Considerably less than a century ago peats formed the sole fuel of the district. More than that, part of the rent was paid in peats, and some days had to be set apart for the "laird's peats," or, as our forebears said, "the Lord's peats."

Besides, it was the only fuel used in school, and when my father was there, every scholar had to take a good big peat with him under his arm every day and place it in the common stock. Woe betide the one who failed to do so. The better class of peats gave a fairly good heat when thoroughly dry. If it was a warm summer, they were soon got into that condition, but this was difficult in a wet season. The common houses had no grates, the fire being on a slab a few inches above the level of the floor, and the peats, to make them burn better, were put on end, never horizontally nor haphazard. A bellows was in almost every house, hanging on a nail, if not in use: because, when the fuel contained moisture, as not infrequently happened, it required a great deal of blowing.

In the Aird of Appin hill are nine or ten mosses, each with its name. They lie in a hollow, a saucer or basin-like tract or depression, bounded on all sides by heights, except where the land descends towards Camserney Burn, though even there the ground is far above the level of the bottom of the mosses. The several mosses are separated from each other by smaller ridges. It must not be supposed these were natural deposits of fuel that had simply to be cut, dried, and carried away. Originally there was so much water in them that before anything could be done it had to be led away in great ditches. That was the all-important point. The peats could not be worked below the level of the water. The man casting with his light spade stood down in a pit, cutting the peats, somewhat in the shape of a bar of soap, and throwing them up on the edge, where they were carried away on a peat-barrow, without sides, to a green place near at hand for drying. After lying a week or so on the "greenan," they were "lifted," and arranged in upright piles of about a dozen peats. After that, in a short time, weather permitting, they were ready for carting. Occasionally they were made into a big peat-stack as a precaution against heavy rains. Above the peat-deposit itself were two or three feet of rubbish—greenish turf and loose black soil, which it was necessary to clear away before we could get to the peats. Every moss was unlike every other, so much so that people could recognise the kind of fuel extracted from each one, wherever they saw it. The best kind was very soft, almost like grease when cut. On being exposed and dried, it shrank and became quite black and hard. There was a brown or yellow sort, at first resembling wet sawdust. Light and porous, it readily dried, and as readily took the least shower. Several intermediate grades might also be distinguished. It may be added that in every deposit or moss the top layers were not so good. The peat improved in quality the farther down we got. Very seldom could more than seven or eight feet of the peat deposit be got, which in all likelihood formed less than half the total formation in many of the bogs. On one occasion, in a very small moss hardly deserving the name, the bottom was reached. The layer below, as my father tells me, was bluish clay.

Our peat-using forefathers did not waste their brains in speculations as to how their supply of fuel originated. Still one thing there was which constituted a profound mystery to Highland people in those days.

In most of the mosses, though not in all, on digging some distance downward, they often encountered trunks and branches of trees or great bushes—hazels, generally, with alders and birches on rare occasions. The wood was in such a remarkable state of preservation that an axe was sometimes required to cut through it. Yet on exposure to the air, it soon crumbled into dust, being thus of very little value. It interrupted their work and set them a-thinking. Not a bush of any kind could be seen growing on the moor around. Where did these remains come from? Before the popularisation of science, no rational or natural account reached their way, and were it not that Noah and his flood kindly came to their help, it is hard to say what theory they might have stumbled against. Even in my own boyhood the belief prevailed, and afforded a perfectly satisfactory explanation, that the trees embedded in the mosses were carried there by that flood. Changed climatic conditions, of which these formations afford evidence, was a suggestion that would not have been listened to.

Why was peat-making discontinued here? For one thing, it might be replied, the mosses were exhausted, if it is borne in mind that this simply means that as much peat was removed as could be worked, *i.e.* the upper half. The lower part is there yet. Owing to the configuration of the ground, complete drainage would necessitate such deep cuttings (perhaps a tunnel through a section of the hill), as to be quite beyond the means of the parties concerned. For another thing, when peat-casting and carting was in full swing, the holdings were more numerous, and smaller, and consequently did not keep the folk fully employed. There were more working-people too, cottars, unattached to the farms. At present, with agricultural work absorbing all our time, we could not afford to spend a month or two on our fuel.

To complete this section just one fact remains to be added: barely within my father's recollection, in addition to peats, vast quantities of moorland sods, heathery divots (half green, half heather), roundish pieces of turf, measuring a foot or so across, were carted off the hill for fuel. It was inferior stuff, but would burn when dry. It would seem that generally these divots were arranged in a rough circle outside the pile of peats on the hearth.

Wild Animals and Game.

As there have been changes in the surface features, so very gradual as to be imperceptible in a generation, so there have been changes in the animals. Among the fauna as among the flora it is a tale of gain and loss. One species becomes extinct, another comes from somewhere, maybe into its place. Appearances succeed disappearances.

Before taking note of this, in briefest outline, one circumstance has to be alluded to that has had great influence on these Highland districts, and may occasionally serve as a clue in unravelling nature questions. The reference is to the great value set on shootings and fishings nowadays. My father remembers very well when the grandfather of the last of our lairds did not get a penny from letting them. In a little

more than half a century they have brought in not less than a quarter of a million pounds sterling. Naturally enough that fact has led to the preservation of game, and the preservation of game means the extirpation, if possible, of all animals and birds preying on the same. That explains, broadly speaking, the passing away of the animals that have become extinct in modern times, though here, too, there may have been exceptions. When restricted within reasonable bounds, there is nothing to be said against this. Animals preying on game, as a general rule, prey on more than that; only it must be mentioned, as a set off, that they keep down vermin, thus showing they have their own place. There is such a thing as "the balance of power in nature," a fact often forgotten both by gamekeepers and by farmers. For gamekeepers, as may be easily surmised, there is some excuse; for farmers none whatever.

Perhaps my father is the only man hereabout who has seen an otter. They were not uncommon on the Tay when he was a boy. Owing to the havoc they wrought among the salmon, they were hunted out of existence long ago.

Another animal long extinct is the badger or "brock" as it was called. They were very numerous in the woods of these districts in the beginning of the nineteenth century. Men known as "brockers" were specially employed to kill them.

Similarly the fox is out of this immediate neighbourhood at any rate. The only quarter where he could effect a lodgment was in the rocky ridge forming the watershed between the hills of Appin and Foss.

My father very well remembers the polecat. It was a large creature of the kind, about the size of a rabbit, very destructive to poultry. But in spite of the efforts of the gamekeepers a weasel still pops out here and there. The eagle has disappeared with the hawks. Only the sparrow-hawk defies extermination, a complete clearance being under existing circumstances scarcely possible. Cases like these are easy of explanation; the strangest thing is the disappearance from this parish of the brown or common hare (the white or mountain hare is got on the hill in hundreds), and that, too, although, unlike the rabbit, it is so fleet that no collie—practically no dog in the country—can catch it, and it has been under protection for a quarter of a century, enjoying a "close time" from March to September.

If it has gone, another rodent has come, the most prolific of all, the rabbit, who lives as merrily on the braes as the fairies did in olden times beneath the green knoll of Tomnadashan. Sixty or seventy years since, not one was to be seen. The people of this estate first saw them—and it was a matter of surprise—in the south of the country when they had to go in their carts on "kain carriage" and other business to Perth.

Another rodent came in my grandfather's time, the brown rat, the harmless black rat being a much older resident. He was said to have arrived in bags sent to a dealer in Weem. Evidently he has come to stay.

Crows and wild pigeons, gulls and plovers, etc., have maintained their ground without appearing to have become more numerous. As regards the small singing birds, most of which keep pretty much to the

woods, it is, of course, not easy to speak categorically, yet considering the denizens of the air as a whole, they probably have been subject to fewer changes than the land animals. The only notable exception is that the starling, which in my father's earliest days was not here at all, at least not near the farmsteads, has in recent times been increasing at a great rate, like the sparrow, and the two now outnumber by far all the other birds, which in consequence may have become fewer. However, no kind, as far as can be ascertained by us, has perished.

Changes in Housing, Food, and Dress.

Owing to the greater density of population in the valley at the time referred to, far more habitations, both farmhouses and cottages, met the gaze of the passer-by. In Camserney, west of the burn, containing now only five abodes, my father remembers twenty chimneys, and that means twenty houses: the rule there was one house, one chimney.

Besides being fewer, the present-day houses differ somewhat in appearance and construction. They are not the survivors of those of that time, they are new or improved erections. He remembers only one farmhouse, and very few cottages, standing to-day as they did then.

Seventy or eighty years ago, all the farmhouses in the parish were thatched, except Coshieville—a wayside inn—and Tirinie. Only a few were thatched with heather or broom or brackens—unless at a very remote time. They were generally thatched with straw. On the timber framework and below the straw were placed "divots" from the hill. On the ridge above the straw—a prominent feature—were arranged long tough greenish pieces of turf, also from the hill; each of these was seven or eight feet long, and about a foot in width. They were cut long to cover as much as possible of the roof, and not seldom were more water-tight than the thatched part. These turfs, thrown across the top, beside each other, and overlapping a little, grew into a whole, and were green in wet weather, brown when burnt by summer's heat. A very well thatched roof might last fourteen or fifteen years, but was liable to being blown away by the wind.

When, as was often the case, those houses were built on sloping ground, the back wall was much smaller than the front, at times only a few feet above the ground. Some of these houses could not be said to be very old—some having been put up within human recollection—others unmistakably showed signs of greater antiquity. All stood on or near the site of still older and smaller huts.

In not more than two or three instances in this strath did cow and man enter by the same door, each then turning to his own end of the house.

Windows scarcely existed, and a window invariably had its lower part opening like a door, or was merely a fixed piece of wood, or a hole filled up by a bundle of rags.

The fire-place, in some of the older dwellings, occupied the centre of the floor, with parents, children, servants, and dogs forming a complete circle around it.

The chimney was capacious, so much so that a travelling chimney-sweep, looking in one day by the door, remarked, "you're a' lum the-gither," and in spite of that was always smoking, after a fresh supply of fuel was put on the fire. Then the inmates could hardly see each other through the gloom and "darkness visible." In the long winter evenings, a lamp or candle struggled bravely to make itself seen. Some houses were far worse than others in that respect. Fixed in a bit of cross-beam near the top, or well up, a long chain hung down the chimney. To its lower end was affixed a bar of iron, with its extreme lower part turned up like a hook. On that were suspended the pots, pans, and baking girdles. When a very little boy I used to play with the chimney chain, when there chanced to be nothing on it, putting my heel in the end, and making the chain rattle. My old grandmother always checked me. Why, I could not understand at first, but in time found out it was because the chain over the fire, when clanking, suggested to her the chain with which she fancied the Evil Person was tied somewhere.

The furniture was scanty, beds, tables, chairs, etc., all being home-made. No tin things were used; it was the day of wooden utensils, wooden stoups for drawing the water, wooden cogs for giving milk to the calves. There was little crockery: wooden porringers and bowls and big wooden basins, out of which four or five persons supped, stood on the table at meal-time. The spoons were of horn, often made by tinkers, who were then great spoon-makers. The most attractive thing perhaps was, in most houses, the old eight-day clock. The grandfather's clock here has been keeping time for considerably more than a hundred years.

In the matter of lighting, it was mostly candles here before the coming of the lamp. My father never had the cruisie going in his house or his father's, though he occasionally saw it spluttering in a few places, less than sixty years since. Up in Rannoch, which in olden times was a noted fir country, they had a peculiar illumination of their own. They dug up the roots of the fir-trees, and setting fire to a bit, got their light that way.

As the furniture was home-made, the food was home-grown. For a long time (in the second half of the eighteenth century and the first of the nineteenth century), potatoes and milk constituted the staple diet, at certain times and places ousting to some extent oatmeal, which, however, regained ground after the potato disease. Porridge and milk, it need hardly be said, was much in evidence. Generally broth was served at dinner-time (between twelve and one). The meat was pork and bacon, with mutton occasionally. Herrings were more favoured then. Beside the door might often be seen a longish bit of wire supported by two big nails in the wall. On that wire hung to dry from a dozen to a score of herrings, each herring hanging by its head.

Some rye was sown, and so rye-bread was in use (hence the Rye-Knoll of Timothy Pont). Oatcakes were very common, and barley-meal was extensively made into bannocks: indeed, barley bannocks, unleavened and leavened, were with many the favourite bread. At first they were made without soda. That kind, as thin as leather, was nearly as tough when two days old. Soda when used raised them a little, and was an

improvement. No flour scone ever adorned the table, and no loaf-bread, except on old Christmas and old New Year Day, the only days in the year that my father, when young, got tea.

Like the furniture and food, the clothing was home-made. Most of the people had a few sheep on the braes, and the wool was sent to a local mill. A few of the more fashionable sort imported a blue cloth called Galashiels, from the place whence it came. The web remained in the house; the local tailors plied their craft beside their employers' firesides. People were afraid that if the tailor got the web into his own house he would cut off a piece for himself.

There was always a patch of ground under flax or "lint"—manufactured in the local "lint-mill." Shirts of it were worn, and were very cold in winter.

Hats and caps there were none, or the "three storey high" was donned only for solemn and state occasions. On every male head old and young was a broad blue bonnet, or Balmoral. Afterwards the "narrow bonnets" or Glengarries came into use, and were much patronised for a while by the younger folk.

(*To be concluded.*)

RULING NATIONS: CONSIDERATIONS ON THEIR CHARACTERS.

By Victor Dingelstedt, Corr. Mem., R.S.G.S.

Introductory.—The word *nation* signifies either an aggregation of persons of the same ethnic family, speaking the same or cognate languages, or a people inhabiting a certain extent of territory and united by common political institutions.

In the first sense the nation is an ideal notion, for there is in the world no large community whose members are all united by bond of blood, speak the same language, and are under the same laws and political institutions. But a conception of a perfect nation, and more or less successful efforts to realise it, exist, sufficiently strong to shape the policy of governments. "National feeling" is a source of many heroic deeds and much self-devotion; it is stronger than patriotism. Properly speaking, existing nations have created States on both principles—ethnic and political or military. A purely political or military State is a product of men's agency without solid foundation, and is occasionally disrupted as quickly as it was created.

A State united by a bond of blood is a product of natural forces; even a weak and landless nation, bound by blood, may live for many thousand years. The idea of belonging to a great nation—capable of redressing wrongs and doing justice—increases a hundredfold the powers of the individual.

We can observe the formation of growing political unities founded on

national feeling, community of race, language, faith, institutions, customs, traditions and history. Out of secular struggles and infinite vicissitudes have emerged in our times some eminently strong and spirited nations, which have virtually concentrated in their hands almost all the effective military, political, financial and industrial power of the world. Britons, Americans (U.S.), Germans, Frenchmen, Russians, Italians, and Japanese have become ruling powers unified by identity of language and strong national feeling. They have created new political situations. Many formerly independent smaller nations have succumbed and become their subject-nations; many others, though theoretically independent, have fallen into virtual dependence upon them in their financial and foreign relations, and even, in some measure, in their home affairs. If agreed, these powers may legislate for the world. This agreement would constitute a tremendous motive power to raise humanity into a happier state and to give it real peace. But the nations do not and cannot agree save in secondary matters; an eternal struggle and rivalry continue among them under a thousand aspects as fierce as ever. If peace is maintained it is only an armed one, based on the sword's point, liable to be broken every instant, and demanding almost universal military service, and hundreds of thousands of millions of outlay.

The ruling nations of to-day are all of recent growth. The French obtained their ascendency at the time of Louis XIV. and were dominant for a short time by the aid of Napoleon I. The Britons and Russians arrived on the scene of the world as ruling nations only after the fall of this conqueror, whereas to Germans, Americans, Italians, and Japanese, their national grandeur have been revealed only in the present generation.

These powerful nations have not come to their ascendency suddenly: there has been a long period of preparation, when a slow process of assimilation, absorption, digestion and annihilation of small or weaker tribes and nationalities went on. This process is the dramatic side of history, at first instinctive, then traditional and at last rational. The geographer is interested in the result of this process, in which the different ethnic elements in play have produced infinite varieties in the character of the nations which have ultimately triumphed.

Besides the variety of races and physical environments, there are also in every great nation individual geniuses who synthesise the virtues and defects of their race, shape its history, make it great, stamp their character on its people, cement them into more complete union, shed their glory on them and constitute a kind of beacon to illuminate the past for posterity.

Whole volumes and profound investigation would be necessary to delineate adequately the complex characters of the nations now ruling the world,—the writer of the present paper has no such ambitious aim and desires only to present some sketchy considerations, from the point of view of the influence these nations may exercise on the world.

The *British* distinguish themselves among nations by a pronounced

individuality, and by the spirit of commercial enterprise and adventure, which qualities, stimulated by the limited resources of an insular life, have forced them to emigrate in numbers (*essaimer*) and to create numerous colonies. Thus, aided by many successful wars, an amalgam of people—in which, besides Angles, Saxons and Jutes, were to be found Norsemen, Frisians, Wendish, Slavonic and Celtic elements—has become a powerful Britannic nation, mistress of the seas, sovereign of a dominion covering a fifth part of the habitable globe, scattered east and west, north and south, in the temperate and the torrid zones.

In creating their dominions, the Britons have proceeded very differently from the Germans, French, Russians or Italians. These nations have considered the new territories acquired by valour of arms, discovery or treaties as possessions of the crown or of the State, and have maintained all their national rights upon them. The British have given to their colonists, who have settled on the fringes of vast and yet unknown territories of the New World, not only full autonomy and independence, but also the fee-simple of those immense and rich domains, and they have given these lands to a few colonists, freed from all responsibility for the mortgage debt that lay upon them. The people of the United Kingdom have conceded besides to its colonists the right of levying all taxes and applying the proceeds for their own benefit, without any contribution towards the mother-country.

There is, in consequence, a great difference between the relations of the French or Russian nation towards their colonies and those of the British towards their vast possessions, at first also colonies, but now almost completely independent powerful nations—Canadians, Australians, South Africans, New Zealanders. The political connection of these new nations to the United Kingdom is slender and mainly moral, and between any two colonies there is no relation at all. The British government and parliament do not even possess the right to assure to all the faithful subjects of his British Majesty free circulation and settlement inside the frontiers of what is called British Empire. It is only in respect of their foreign relations that the Colonies remain partly dependent upon the mother-country.

Though dispersed and loosely connected, the thirty-six or more parts of the Empire over which flies the Union Jack of Britain constitute the greatest world-power ever seen. The British have learned to combine local autonomy with Imperial loyalty. The ascendency, prestige and commanding influence won by this people over so many other nations is the more remarkable in view of the fact that in creating their power on land and sea and governing their domains they have steadily maintained the principle, "*arma cedant togae*," that the civil and not the military element must in spirit and in practice remain supreme. The military forces employed by the British in administering their numerous and vast colonies are very small; obedience to them is founded on respect and loyal regard for the national character—integrity, faithfulness, honesty, respect of right, confidence in justice, tolerance, respect of the individual and his opinion, mutual forbearance. The English have not the amiable qualities of French or Italians, nor

have they their artistic talents. Matter-of-fact people, intelligent, clever, serious, active, not over-sensitive, not over-logical, practical, suspicious of general principles, more respected than loved, they have faith in justice and moral righteousness. It is their great virtue.

It is thanks to their confidence in right and justice, their regard for the interests of others, their practical good sense and high statesmanship, that they have succeeded in creating the greatest world-empire, without finding it ever necessary to recur to obligatory military service or to extravagant military expenses. The British nation maintains its rule over its Asiatic subjects at odds of four thousand to one.[1]

The system of Great Britain in treating the numerous nationalities entering into her domain is founded on respect for all creeds, languages, national customs and peculiarities ; with the exception of Ireland, India, and the Crown Colonies, it leaves to them a most complete autonomy. This system of attachment, not by coercion but by good will and moral bonds, has had a great success, and promises to consolidate the Empire still more.

The British possess great national qualities and a genius for popular government. A great effect upon their character has been produced by their insularity—an indefinable sentiment which permits an Englishman to live long undisturbed by anything foreign, which might trouble his beliefs, change his ideas, disturb his customs. He has an individual pride, a strong sentiment of duty, and is imbued with great common sense. Highly conservative, he has a great respect for tradition and precedent, and not much love of abstract principles. The English show great tolerance and respect to individuals. The tolerance of others' opinions has become quite habitual in their every-day life. The Englishman is phlegmatic, patient, calm, but on occasion capable of an exuberant enthusiasm. "Cheerful, enduring of small hardships, impatient of petty injustice, careful of the conventions he has made for himself, lover of children, obedient to women, lavish with his savings, particular about a penny's worth, polite so long as he is not patronised, as good a man as his father" (*Times*). The British virtues are political instinct, sound judgment, inbred sagacity and integrity.

British influence and prestige are immense all the world over, and quite specially in the Far East and Africa.

British statesmen are bearers of great political ideas, well suited to reconcile the needs of great political aggregations with the necessities of allowing to the constituted parts the freedom and autonomy indispensable to their progress and development. The Confederation of Canada (1867), followed by the Federation of Australia (1900), and more recently the establishment of a self-governing dominion in South Africa, are and will remain as long as the earth turns around the sun glorious feats of superior statesmanship.

Britons deserve to be admired and imitated not only for their skilled statesmanship and their art of governing alien peoples, but also for their healthy customs and manners and their fair dealing. No people has

[1] *S.G.M.*, vol. vii., 1891, p. 574.

better understood the profound truth of the old saying—"*mens sana in corpore sano.*" No people, except, perhaps, the Romans, have made such a frequent use of the bath, and certainly no other has practised so much every kind of sport and bodily exercise. Englishmen have also taught respect for truth and impartiality—that honesty is the best policy. English newspapers deserve the greatest credit because they do not consider it in their interest to hide what is true, when it is disagreeable, or to conceal their opponent's opinion.

It may seem now to an outsider as if the British mother-country were traversing a very serious national crisis. There are problems of most vital importance that do not find as yet satisfactory solution, and divide the people into irreconcilable groups. Yet there is scarcely any doubt that satisfactory solutions will be found at last amid the struggle of opinions. This Coronation year, to speak with the words of Mr. Churchill, "should make manifest to the world the deep and fundamental unities which underlie the clamorous conflicts of British national life."

Americans (Yankees), the so-called cousins of the British, because the youngest, most ambitious, and energetic great nation of the English stock, above one hundred millions strong (if we are to trust statistics), are on the way to acquire a preponderating influence over a large part of the globe. Though using the same national language as Britons, they are in many ways distinct from them, being composed of more heterogeneous and fluctuating ethnic elements, not having had as yet time to fuse, subject to different geographical conditions, ruled by different political institutions of a highly democratic, but also plutocratic, kind. Without much historical tradition or precedents, they are free to "go ahead," untrammelled, towards what is considered modern progress.

The ideal for the present being mainly to get rich, they develop their money-making faculties with great energy, and they have made known to the world a new social disease—gold plethora. They increase rapidly owing to a high birth-rate and immigration from Europe. About 42 per cent. of Americans are of coloured races; the relative proportions of their diverse white races is subject to variations. On the whole it is a high-spirited, active, enterprising, persevering, robust, healthy nation, proud of its star-spangled banner, and exercising portentous and constantly increasing influence not only on the mind of its new citizens who arrive from all points of the globe, but also in the world's affairs at large.

The high level of its popular instruction, the prosperous state of most of its scientific institutions, the wealth of its churches, the care for higher sanitary conditions of life, the admiration in which they hold the literary and artistic products of old Europe, all these testify that Americans are not given up only to material considerations. They have recently shown the high ambition, worthy of a great nation, of redressing wrongs and establishing justice in the world. Their philosophy is pragmatical.

As, however, wealth is the father of idleness, numbers of Americans

have learned only to enjoy life; they spend the money acquired by their seniors at home or abroad in a manner very far from instructive. American cities are honeycombed by the vile methods of low-class politicians, and the dream of "get-rich-quick" produces many loathsome effects.

Two years ago an ecclesiastic proposed the question: "The people of the United States are to-day incontestably the richest in the world—are they also the happiest?"[1] The question, though not answered, sufficiently reveals the mind of its venerable author. The dollar is not all. Americans represent "Americanism"—the extreme outcome of Western civilisation—the opposite of Eastern conception of happiness. On one side there is hurry, bustle, enterprise, activity, "go ahead"-restlessness; on the other, quiet, contentment, resignation, fatalism, conservatism, elaborateness of courtesy, formality of manners, no haste, an inner rather than an outer life. In both cases there is much corruption.

Americans form a nation which appreciates the best individual brain and energy, independently of any social advantages, and, thanks to that, they continue to attract to their land the greatest number of those who have brains and hands and do not find occupation for them in their native countries. Americans are governed by democratic laws, they have no class prejudices, no social trammels of any kind, and a really capable man, whatever his origin, has perhaps nowhere else so good a chance of getting what he is worth.

The ethnic composition of the white population in the United States is fluctuating: once the Anglo-Saxons predominated, later it was German and Irish, now it is Slavs. With this fluctuation the characteristics of the nation must necessarily be also subject to variations. It has become a kind of melting pot, or crucible, in which different ethnic elements act and react on each other with the fewest obstacles until all are fused into loyal and aggressive American citizens.

Americans have to reckon with an increasing admixture of inferior types of humanity. They have to face the formidable Negro question, which is far from a satisfactory solution. Race contempt is as yet strong in the United States, and we can only hope with Sir Harry Johnston[2] and the well-known Dr. Booker Washington that it is a passing phase in the history of mankind, and that with the acquisition of wealth the despised (as in the case of Jews) may come into honour.

A European, emigrating to the United States of America, finds himself in totally different conditions of life from the geographical, as well as from the social, point of view, and these new conditions seem to affect the physique, the habits of life, the mentality even of the immediate descendants of the emigrants. According to the observations of the Immigration Commission, the children of immigrants born in America even within few years after the arrival of their parents do not resemble their forbears, even the dimensions of the head seem larger. The Commissioners are inclined to believe that the beginning of the formation of

[1] Monsignor Count Vay de Vaya and Luscod, *see* "The Inner Life of the United States," *S.G.M.*, xxv., 1909.

[2] *The Negro in the New World.*

what they are disposed to consider an American type manifests itself at once.

Americans share in a very high degree some of the social and political evils of old Europe, such as the hatred or mistrust between labourer and capitalist, violent discontent with the established order, profound political and administrative corruption, misery, unemployment, frauds, etc. etc. Some of these evils, such as abuse of the power of money, have reached there a highly dangerous degree for the welfare of the masses. Eloquent and energetic moral appeals remain without much response even when raised by such a man as ex-President Roosevelt, personifying the best American—an ordinary man of intense vitality, with an infinite capacity for hard work and concentration, versatile, practical and many-sided.

Americans have conquered the Philippines, Guam, Porto-Rico, Samoa, and they are, besides, extending their grip upon Liberia. They have as yet much to learn in the difficult matter of ruling subject nations. The British, German, Russian, and French nations have all had individual experience, and possess more or less adequate national methods of dealing with the numerous aliens under their respective national banners; whilst the Americans, with their democratic ideas, their doctrines of equality, create social chaos in such oriental communities as the Philippines, where for centuries the idea of the inequality of men has reigned. There are also difficulties in a nation governing another on principles which are in contradiction with those which govern its home affairs. Nevertheless, Americans may be already proud of what they have done in the Philippines.

They may derive a far greater satisfaction from the energy, vigour, and enterprise they have shown in excavating the Panama Canal, now almost certain to be completed. This will bring them a new and great advantage in commerce over Europe, as, with the opening of the Canal, the Far East, Australia, etc., will become much nearer to New York than to the ports of the English Channel.

Germans.—The great Teutonic nation, vigorous and enlightened, about one hundred millions strong, is kindred to the Scandinavians, Dutch, Flemings, and Anglo-Saxons. Thanks to their valour and many sterling qualities they have risen in a comparatively very short time to an eminent position as a "*Weltmacht*."

Germans enjoy predominance not only in Germany proper, where they constitute an Empire in the shape of a federation of twenty-six States, but also in Austro-Hungary and in a great part of Switzerland, though the mentality of the Germans in the two last independent countries is quite distinct.

They possess outside Europe colonies covering above one million square miles, and inhabited by fifteen millions. German families also occupy the thrones of Bulgaria, Roumelia, and Greece.

Enjoying an ancient and high order of culture, the Germans exercise world-wide influence. Politically of almost no account some sixty years ago, they have risen to-day to the rank of the first military power on land, and have become dangerous rivals of Great Britain on the sea.

Though there are differences in the character of Germans in different States, yet they may generally be considered as highly disciplined, cultured, commercial, orderly, methodical, honest, persevering, gifted, proud, and self-conscious. They value rank and social distinctions, and enjoy small individual independence. Before expressing an opinion or taking action, a German looks to his superiors, who are rather intolerant, and require from their dependants and subordinates obedience and deference.

A German *Hausrater* loves his wife and his children, and is faithful in what he considers his duties to them; but he knows how to assign to every one of them his proper place, and remains uncontested chief and superior. Whatever may be his calling, a German is usually satisfied with what he is, is proud of it, and remains faithful to his duties. The Germans are idealistic, sentimental, poetical. Though arts and literature stand high in Germany, the Germans are particularly inclined to scientific work. They have a host of *Doctors* and *Gelehrte* always proud of their science. Not so quickwitted as Frenchmen or Italians, they are more persevering, and not seldom outstrip them by sheer perseverance and painstaking. They have given to the world most profound thinkers. Thinking for a German is what lovemaking is for an Italian, talking for a Frenchman, musing for a Russian, money-making for an American, sport for an Englishman. Germans are excellent patriots; they work zealously for pangermanism, and sing enthusiastically at their feasts—"*Deutschland, Deutschland ueber Alles.*" They possess much collective pride (*Hochmut*). Guided in their conduct and their behaviour rather by the head than by the heart, they do not enjoy much sympathy at the hands of non-Germanic people, and they are not popular either in France, or in Italy, England, or Russia. They have almost continually to put down revolts in their colonies. This want of popularity of Germans may perhaps be explained by the rigidity of their principles, some roughness in their behaviour, their little indulgence for the ordinary weaknesses, defects, and shortcomings of people they consider as their inferiors, their want of tact and forbearance in judging other men's conduct. The German school suffers from some excess of *Wissenskram*, which produces a particular type of lanky, spectacled pedant and philister, and *Grubelkopfe*. Content with abstract reasoning, the Germans have elaborated many radical, social, economic, and political reforms, and yet continue to live pretty peacefully under a very conservative and semi-absolute *régime*. The new industrial classes are gaining ground, but are still separated from the governing and military classes by a considerable gulf. Socialism makes considerable progress, and the government, sustained by the conservatives, wages a fierce warfare against this party ($3\frac{1}{4}$ million adherents).

Germans are spread all over the globe. They emigrate in numbers everywhere, but mainly into America. With their technical knowledge, their industry, skill, and moral qualities, they do everywhere excellent work. They are good agriculturists, teachers, military instructors, merchants, artisans; in fact, there is scarcely any trade or art in which they are not more or less skilled. There are seven million Germans in Russia; their merchants are numerous in the Near and Far

East, as also in Africa: and with their excellent commercial education and knowledge of foreign languages, they not seldom succeed in ousting their British and other competitors.

The Germans do not possess, however, in any high degree, the natural gift of influencing other people's ideas and actions. They are admired, but their admirers do not think of imitating them.

The Germans show themselves very active in defending and spreading the German language. Highly elaborate, rich in its vocabulary, and particularly favourable to the formation of combined words, it is yet rather rough to the ear, not very elegant, and difficult to learn. It is structurally involved, and with the verb, or the verbal proposition, at the end of the period, requires a sustained attention on the part of the listener or reader. Though the German language possesses perhaps the highest philosophical literature, and is very rich in words of every kind, its knowledge by non-Germans is not common. The Germans do not expect a knowledge of their language on the part of foreigners, and consequently they apply themselves to the learning of foreign languages, and they are often excellent linguists and good translators.

French and French-speaking nations are about fifty millions strong, and are the most united and the most homogeneous of ruling nations, there being scarcely 12 per cent. of their number outside the frontiers of France (Canada, Alsace-Lorraine, Switzerland, Belgium). It is a rich, enterprising, industrious, and highly gifted nation, which has long exercised a world-wide influence of a moral, intellectual, social, and political kind.

The French-speaking nation has long been and remains still a true vanguard in the march of mankind towards higher and better destinies. It is a nation of new ideas and discoveries, and of hardy initiative. Their fortunate character, easy and optimistic, with sufficient forethought to respond to the not overpowering conditions of daily existence, their quick wit, humour, and gaiety, ingenious and rapid mental processes, their natural amiableness and responsiveness, have made them favourites with other nations. The number of foreigners in proportion to the native population is greater in France than in any other country. Their literature and language are the most widely spread. Their happy qualities are in harmony with their fortunate geographical situation, genial climate, rich soil, abundance of all useful products.

France has produced great soldiers, statesmen and eminent men in all branches of science, philosophy and arts.

The French have a vivid, ardent temperament. Of all nations they are the most divided in the solutions offered of the political, religious, social, economic and other problems that agitate the world: they are the most fierce in their internal struggles, there is scarcely any single point, save a great national disaster or war capable of uniting them. French internal struggles have the advantage that they maintain the alacrity of the national spirit, provoke continual revision of any established truth, and initiate new and fruitful researches. *Du choc des opinions jaillit la vérité.* As no political, social, scientific or moral ideal is

allowed to remain unprovoked by an ideal of another kind; as no philosopher, moralist or statesman is allowed to remain unassailed, every thinking man is forced to take part in the conflict and thus to sharpen his intellectual weapons, weigh once more his arguments, study ever more carefully what may strengthen his position or weaken that of his adversary. There is an immense advantage in such a school for the development of mind and character. If, as Leopardi has affirmed, "ideas rule the world," the nation possessing most intellectual activity has the best chance of exercising the greatest moral and intellectual influence upon the mind of mankind.

The French, with the Italians, are the most polite, refined and elegant of the European nations; their code of civility and their tastes in such important departments of life as dressing and eating are almost universally accepted.

The French are the most thrifty of all nations; they are the creditors of the world, as the value of their foreign stock attains the fabulous sum of about two milliards of pounds.

The beautiful French language has contributed much to the popularity and influence of France. It is elegant, agreeable to the ear, precise, logical, clear, elaborate, supple, and not difficult to learn. It is admitted to be the language of diplomacy and is largely used by the higher classes in Russia, Poland, Italy, and Austro-Hungary, and before the war of 1870 was a favourite even in Germany. Gallomania was some time a prevailing social epidemic in Europe. Now French influence, like French military power, is on the decline; they do not increase in numbers as fast as do their terrible rivals on their eastern frontier, perhaps also they allow themselves to be outstripped by other nations in popular instruction, for they have still a number of illiterates. But France still remains a great colonising power; she once lost her colonies, but has succeeded in reconquering a colonial empire, which now covers an area of above four million square miles (4,367,746) and contains a population one and a half times as large as that of the mother-country.

Though the French do not emigrate much themselves, and send mainly their functionaries to their colonies, yet their moral and civilising influence upon native populations must be regarded as very considerable.

There are more than a score of nations who acknowledge French supremacy, and among them are many Musulmans, so that France, after England and Russia, is the greatest Musulman power in the world. The French administer their colonies mildly with sufficient regard to national idiosyncrasies; most of them enjoy some measure of autonomy, and have elective councils to assist the governor-general. Algeria is regarded as a part of France. The older colonies have direct representation in the French legislature—senators and deputies.

The *Italians* are about thirty-five millions strong, and are therefore the least numerous of modern ruling nations, but answer best to the conception of a nation. With relatively small exceptions they live inside the limits of their own State, or on contiguous territory, speak the Italian

language or Italian dialects, and have in common long history and traditions.

Unhappily divided under foreign yoke, they have developed a strong regionalism incompatible with true national sentiments. Like other great nations they have been constituted of many heterogeneous ethnic elements—Mediterranean and Alpine races, as also Scandinavians, Liguri, Iberi, Imbri, Etruscans, and Greeks.

For the fourth time in its long and glorious existence this people is revivified and is again a young nation full of energy and hope. It is a highly gifted nation, rich in virtues no less than vices. The world owes to Italians the revival of science after long stagnation (the Renaissance); the recognition of the dignity of an individual; respect for the child; and a great number of public works of universal utility. Their artists, architects, men of science, philosophers, poets, theologians count by thousands. They have a natural gift of eloquence and much musical talent. They are lively and impressionable, imaginative and inclined to exaggeration, quick-eyed, brilliant, and patient. Exuberant and impulsive, the Italian expresses himself in gestures and words, does not always allow himself time to reflect, acts promptly, and has afterwards reason to repent.

There is, however, a considerable difference in the temperament and character of the inhabitants of different Italian provinces, and this difference is especially notorious between Northern and Southern Italians. Though the Italians have won their national independence and have become undoubtedly one *Grande Potenza*, yet they have not succeeded in so fusing together as not to allow mere local and provincial interests to be placed above national ones.

The Italians are crushed by heavy taxes, they do not often find occupation at home, and emigrate in considerable numbers. These emigrants are mostly skilful and peaceful labourers, easily satisfied, frank and open in manners, prompt to resent injury, ingenuous, practical, highly superstitious, ignorant, but easily adapting themselves to local requirements. Under the weight of poverty an Italian may sink into every excess. Notwithstanding their rich soil and mild climate the Italians are a nation, not of agriculturists, but of citizens. Their numerous and beautiful historic cities, situated mostly near the sea, and having each in turn played a world part, have attracted their energies at the expense of agriculture. The situation of Italian *contadini* is rather deplorable—on account of the extensive pastures and *latifondi* (large estates).

The rich plains are but scantily populated, whilst poor mountain sides, on account of too great division of land, are over-populated. In the once splendid cities, gradually recovering from their ruins, there are as yet many poverty-stricken persons, perhaps because, instead of artisans, there are too many notaries, barristers (advocates), priests, monks, loungers, politicians, and mendicants.

The prevalence of city life has many well-known drawbacks. If a citizen is in some respects less ignorant than a countryman, he is certainly more depraved and less healthy in mind and body. Italians

are all politicians. Many of their cities have enjoyed political importance and have had an exciting history of internal conflicts between themselves, or between different factions of the inhabitants of the same city—nobles and feudatories, commercial and industrial classes and poor people, and also between different political parties, such as Guelph and Ghibelines. These struggles have developed in the people much craftiness, cunning, diplomacy, and undesirable vices.

The Italians have proved highly patriotic; their struggle for national independence will always remain an inspiriting instance of the unlimited devotion and self-sacrifice of which a nation is capable for the sake of patriotism. But they seem to want some particular stimulus to work unselfishly in the interests of their country, and now, the great struggle over, they suffer from moral and political scepticism.

The Italians are highly humane. Italy is the native country of Cesare Beccaria and Cesare Lombroso, and there is hardly any nation which treats its criminals with so much human consideration.

These sympathetic qualities and the great services rendered to arts and sciences, have provoked, as in the case of Greece, a universal sympathy for their national cause, and helped them to their national independence.

Italy attracts foreign non-occupied visitors more than any other country. Independently of its genial climate, beautiful sites, and numerous objects of artistic and historic importance, its attraction lies in a particular charm and halo of romanticism which in the imagination of so many people enshrines things Italian, evokes the most tender sentiments, revives even in elderly people the blessed time of their first love and their youthful poetical and ideal aspirations. The Italians are hampered in their progress by their glorious past; they would move more freely if they could bring their minds more towards the future than towards the past. The Italian colonies (Erythrea) have as yet not answered to expectations.

Russians, more than one hundred and fifty millions strong,[1] are the most powerful branch of the great Slav family of nations. The Russian language is the least known of European languages outside Russia, and is the most difficult to learn; the Russians themselves, having been submitted to Byzantine and Oriental influences, are a nation very distinct from western nations, and in consequence little known by them. Happily publications about the Russian people are abundant, and the Russians themselves strenuously endeavour to give information about their land and inhabitants to the Western world, to which they are becoming more and more connected.

On the occasion of the last Paris Exhibition two vast official publications were prepared, which are models of thoroughness—*La Russie à la fin du 19ème Siècle* and *La Russie extra-Européenne et Polaire*.[2]

The best publication about the Russian people in the English

[1] According to the census of 1910 the population of the Russian Empire is estimated at 160,095,200.

[2] Reviewed in vol. xxii. (1901) of the *S.G.M.*

language is undoubtedly that of Sir Donald Mackenzie Wallace, whose substantial work appeared first as early as 1877; it was subsequently enlarged, revised, and in great part re-written in 1905. The venerable author has resided long in Russia, has learnt its language, sojourned amidst different classes of its people, and enjoyed particular facilities for studying the land, its inhabitants, and their institutions. In this *Magazine*[1] many contributions to our knowledge of the Russian nation have been made, of which the most remarkable are to be found in the address by Charles Sarolea, delivered before the Society in Edinburgh in 1906.

German authors, very naturally, have taken much trouble to learn about Russia, their powerful neighbour, and have produced many works of value.[2]

Russians are a vigorous, well-marked, typical nation, serving as intermediary between the old East and the new West, and as a protecting bulwark of modern civilisation against the floods of ancient Asiatic barbarism. Composed, like all other great nations, of many heterogeneous ethnic elements, the Russians have exercised a civilising influence in eastern Europe, and over a considerable part of the Asiatic continent, and have not only succeeded in implanting some order and civilisation in their vast Asiatic dominions, but have also played a very influential part in politics as a world-power.

Russia constitutes the centre of attraction for all the Slavs in the Balkan peninsula, she has considerable prestige in the eyes of Bohemia, Moravia, and the Slovacs, Ruthenians, and Slovens in Austro-Hungary, and keeps in her hands the destinies of about fifty different alien subject nationalities (some of whom were once powerful nations of ancient civilisation).

Climate and the geographical conditions of the Russian empire have had a very potent influence on the Russian character and political institutions, as was excellently explained by Mr. Charles Sarolea. Such particular historical events as the Mongol domination, the reform of Peter the Great, have also exercised on Russian mentality a very strong influence. The influences both of physical nature and of history have been so considerable, that the Russian character is more or less to be detected through all the various distinctions of classes, and through all the numerous racial varieties.

Russians are a very conservative, devoutly religious nation, with a very considerable numerical predominance of the rural classes, or peasants, plunged as yet in profound ignorance and superstitions.

The fundamental idea which governs a true Russian is Charism or, in German expression, a *Gottesgnadentumsgedanke*—a belief that in all human affairs a man's individual efforts are of no great importance, but that the main confidence must be placed in God, his saints, or in chance. Thence a certain recklessness in character—a tendency to drift. The Russian word *aros*, which impressed Prince Bismarck, is the popular

[1] See notably the vols. for 1888, 1899, 1900, 1904, 1905, and 1906.

[2] See for instance Alfred Hettner's *Das Europäische Russland*. Leipzig, 1905.

expression of a blind confidence in the invisible and supernatural powers.

According to Paul Bourget the Russian seems to take a strange delight in torturing himself, so much he shows himself capable of receiving painful impressions, and of deepening and renewing them. The Russian *régime* does not train leaders. The numerous *tchinovnics* do perfunctory service, and are rather heedless of criticism from below.

A long, cold and dreary winter, and a short, hot, flowery summer, are contrasts in climate which find their counterpoints in the character of the Russian nation. As nature does not allow the peasants to work otherwise than spasmodically, so they labour mostly by fits and starts. There are peaceful and stormy days. A Russian peasant, who represents by far the most numerous class of the Russian nation, is the most peaceful and patient being in the world, but at times, under stress of exceptional circumstances, he may be roused to a fury of very dangerous kind. There is often a latent savagery in the breast of even a cultured man which lies dormant until special conditions arouse it. These outbursts are the easier the more superficial is the culture of the individual, the less is the self-command imposed by the general progress of humanity.

As a young nation the Russians are inclined to act in conformity with their natural impulses: they possess strong gregarious feeling, respect their kindred, are very convivial, not very rigid in morals and not very persevering in their undertakings. Their humour is rather uncertain: generally melancholy, they are subject to wild outbursts of gaiety. They are intolerable of individual exclusiveness, *il faut hurler avec les loups*.

According to some observers the Russian combines the mystic enthusiasm of primitive ages with the refinement and scepticism of modern times. One of the most prominent characteristics of Russians is the strength of class-distinction.[1]

The foreign heterogeneous element in Russia is very strong, and constitutes nearly a third of the entire population. According to some writers, in default of federative principles, only an autocratic power could maintain together such a huge empire.

The case is the same as in India. Having numerous subject-nations either intermingled with the Russians proper, or living in their vicinity without natural frontiers, the government is obliged to keep a strong hand over all.

Russians behave towards foreigners with respect and cordiality, and they treat all natives whatever may be their creed—the Tartars, the Kirghiz, the half-nomads and entirely nomads—as being on a footing of perfect equality with them. The Russians have much *bonhomie*, and what they call "broad nature," a kind of disregard of petty social obligations and details, a tendency to sweeping, inconsiderate actions.

The Russians are doing excellent work in Central Asia and Siberia,[2]

[1] Wallace. *Russia*, vol. ii. p. 451.

[2] *S.G.M.*, vol. xv. (1899) p. 369, and vol. xvi. (1900) p. 25.

but they have as yet not succeeded in obtaining from the Caucasus all the benefits that this splendid country offers. The work of russification goes on apace.[1]

The Russian language, which is phonetically rich, is spreading rapidly. It is difficult for a European to learn. Though of Aryan origin with slight intermixture of Tartar, it has certain sounds unknown to West-European tongues, and its roots, though in great part derived from the same original stock as those of Græco-Latin and Teutonic languages, are not easily recognised. The grammatical forms and constructions are peculiar and present many irregularities. Cultivated Russians are often good linguists.

The *Japanese* must already be considered as a ruling nation, so considerable have been their victories, so effectual their advance in progress, and so astounding is their national genius.

They are an old nation of Mongolian stock, which long remained almost unknown and obscure, and sprang forth suddenly into the foremost rank of modern nations. It is as if the whole social organism of this extraordinary people has thrilled with the pangs of a new birth at the contact of a new world. It is a nation which has certainly its defects and vices like all other nations, but which possesses rare and high qualities. The Japanese are sober, intelligent, enduring, patient, industrious, polite, skilful in many handicrafts, ready to assimilate foreign ideas and inventions, and certainly not devoid of original genius.

This *Magazine*, during the twenty-six years of its existence, has contributed much to the knowledge of Japan and Japanese. The older readers will remember the excellent paper on this subject by a former consul at Yokohama, Mr. Russell Robertson.[2] Already at this date the Japanese attributed great importance to popular instruction; there were but few who could not read or write to some extent. Thus instruction, the real basis of the greatness of any nation, was already more advanced than it is actually in modern France or Italy. Even twenty-three years ago the English language was pretty generally taught throughout the Empire of the Mikado, and now every travelling Japanese speaks this tongue more or less well.

An acute characterisation of the Japanese has been given in this *Magazine* by Professor C. G. Knott.[3] According to this author the Japanese nation, though imitative, has not been a greater borrower from its neighbours than were our own ancestors, who got their religion from Judea, their philosophy from Greece, their law from Rome.

The Japanese passed an historic period of two and a half centuries of complete isolation from the world at the time of Hideyoshi (the Napoleon of Japan), Ieyasu and his grandson Iemitsu, under a feudal system, free from serious internal troubles, evolving their exquisite art and their elaborate etiquette. They developed filial piety and fealty to an in-

[1] See "The Russian Advance," by Albert Beveridge, *S.G.M.*, vol. 1904, p. 271. "The Russian Road to China," by Lindon Bates, junior, *S.G.M.*, vol. xxvi. (1910), p. 655.

[2] *S.G.M.*, vol. iii. (1887), p. 369.

[3] *S.G.M.*, vol. viii. (1892), p. 177.

ordinate degree, as well as self-reliance, self-sufficiency and self-abnegation. Two qualities stand out prominently in the Japanese character, patriotism and facility for detail and power of application.[1]

The industrial and commercial development of Japan, as we learn from the paper on this subject by James Troup,[2] is already considerable.

The very interesting question of the future of Japan has been elucidated by W. Patrick Watson.[3] The great quest of the numerous leaders of the Japanese revolution in 1868 was, according to this author, to discover the best methods of foreign countries and to apply them,—in order to place Japan on an equality with the great nations of the world. It is what the Chinese in their turn are endeavouring to do now. The leading Japanese statesmen had a brilliant, almost marvellous success, but the nation, according to Mr. Watson, has played but a very secondary part in the great evolution. There remains thus a great chasm between the rulers and the ruled. The people remain cheerful optimists with a capacity for contentment with small things. There is, however, it seems to us, an exaggeration in this view. In every political and military action there are ever leaders and followers, and the first can only do what the last will permit them.

The Japanese are certainly traversing a very serious crisis; with a new conception of things and entering upon a remodelled life they can hardly expect to conserve all their old virtues, but they may hope to be able to develop new vigour and new virtues. "It is too early yet to estimate the moral and spiritual significance of the silent sacrifice, the unflinching devotion to duty, which illuminated the war and astonished an unsuspecting world," says very rightly the reviewer of Watson's prophecies.[4]

A great success in war always mightily contributes to the strengthening of patriotism, which in its turn leads to victories of a higher intellectual order.

The advent of Japan into the family of ruling nations raises the most difficult and controversial question of the rightful relations between white and coloured people. If white are proud, yet so also are the yellows and even the black. In regard to intelligence, sagacity, energy and efficiency in all human concerns, not only is there no reason to admit their inferiority, but there are some reason to apprehend their superiority as to adaptation for life. Otherwise there would be no need to fear them. They may lower what we call "white standards" of living, they may oblige white people to live a more sober, more simple and less comfortable life, and this may be a calamity, though we do not believe it, but in any case the fact does not in any way justify us in treating them otherwise than on a footing of perfect equality. They will not allow that, and perhaps with the will they will also get the might.

[1] Alfred Stead. "Great Japan," *S.G.M.*, vol. xxii. (1906).
[2] *S.G.M.*, vol. xii. (1896).
[3] *S.G.M.*, vol. xxiii. (1907), "The Future of Japan."
[4] *S.G.M.*, vol. xxiii. (1907).

THE GEOLOGY OF EDINBURGH.[1]

In 1859 the Geological Survey of Scotland issued its first map, the one-inch sheet 32, covering Edinburgh and its neighbourhood, and a memoir, written by Sir Archibald Geikie and Mr. H. H. Howell, in explanation of the map, appeared two years later. A second edition of the map was published in 1892, and five years ago a very valuable memoir dealing with the oil shales of the Lothians was given to the public; but it is only now, after an interval of half a century, that a second edition of the Edinburgh memoir makes its appearance, along with a third edition of the map, under the editorship of Dr. Horne. Both publications are sure to receive a very cordial welcome.

Much has been done since the first edition of the memoir was written to extend our knowledge of the geological structure of an area that has always been a classic field for students of geology and physical geography. In 1861 the oil shale industry was still in its infancy; since that date a phenomenal development has taken place all over the mineral fields of the region. Petrography has suggested a solution for some of the most difficult geological problems. The area under discussion, which embraces practically the whole of Midlothian and a considerable section of Linlithgowshire, has been carefully re-examined by the officers of the Survey, and the present volume is an enduring tribute to the thoroughness with which their labours have been carried out. Moreover, the work of the mining engineer and the patient research of private investigators, who are worthily maintaining the tradition set by many famous predecessors, have combined to throw a flood of light upon the geological structure and the physical history of the district such as was not given to the geologists of fifty years ago.

In view of the fuller information available the memoir has been entirely recast and most of it has been rewritten; indeed, there could be no more striking evidence of the great strides made by Scottish geology during the last half century than is furnished by a comparison of the old edition of the memoir with the new. Thus the stratigraphy of the Carboniferous Limestone Series has been worked out with the minutest detail, but even more remarkable is the advance that has been achieved in the study of the volcanic rocks of the area; largely as a result of petrographical analyses it has been possible to subdivide and classify the various volcanic materials with very great precision, and the representation of the different types of these rocks forms one of the chief features of the third edition of the geological map.

It is quite evident that the area has been resurveyed and the memoir written chiefly for economic purposes, and much of the detailed informa-

[1] *The Geology of the Neighbourhood of Edinburgh* (*Sheet* 32 *with part of* 31). Second Edition. By B. N. Peach, LL.D., F.R.S.; C. T. Clough, M.A.; L. W. Hinxman, B.A.; the late J. S. Grant Wilson; C. B. Crampton, M.B., C.M.; H. B. Maufe, B.A.; and E. B. Bailey, B.A.; with contributions by J. Horne, LL.D., F.R.S.; W. Gibson, D.Sc.; E. M. Anderson, M.A., B.Sc.; and G. W. Grabham, M.A.; and Petrological chapters by J. S. Flett, M.A., D.Sc. Published by order of the Lords Commissioners of His Majesty's Treasury. 1910. Price 7s. 6d.

tion as to the position of the various strata, their characteristic fossils, the thickness, quality, and physical properties of the various seams of coal or shale, or the value of the different building stones with which the area is abundantly supplied, is of interest mainly to the mining or geographical expert, who will certainly find the numerous bore sections, the many text figures, and the beautiful micro-photographs exceedingly instructive. Several of the geological features of the district are illustrated by a number of excellent plates.

In addition to the very complete bibliography appended to the volume, in one case a whole chapter, and in others several pages have been devoted to a brief summary of the history of the investigation of the different systems found within the region, and of the literature to which the investigation gave rise. Generous recognition is continually made of the labours of previous workers in the same field, and it is remarkable how many of the early theories have been confirmed by recent research. Many of the conclusions as to the character and development of the rocks of the Pentland Hills arrived at by Charles M'Laren seventy or eighty years ago have been fully established in the course of the latest survey. On the other hand, sufficient evidence has not been forthcoming to substantiate Sir Archibald Geikie's view that the principal volcanic vent from which the material outflowed over the Pentland area is situated in the low-lying area of the Braid Hills; the conclusion arrived at by the Survey is that the main orifice lay farther west, in the vicinity of Colinton. For many readers the most interesting feature of the memoir will probably be the latest attempt to interpret the volcanic records of Arthur's Seat, to which a chapter is given. The six-inch map of this area which is appended to the volume is of the greatest assistance in following the argument of the text. As long ago as 1834, M'Laren, perhaps the most acute of all the observers who have given their attention to this area, published his interpretation of the history of Arthur Seat in a series of articles which first appeared in the *Scotsman*, and were afterwards embodied in his book on the geology of Fife and the Lothians. He was then of the opinion that there was evidence of two periods of eruption, separated by a long interval of time, during which the first volcanic deposits were much folded and denuded, and that the main part of the hill rests unconformably upon the remnants of the first eruption. Although the author abandoned his view of a double period of volcanic activity in the second edition of his work, it was accepted by Sir Archibald Geikie after he had surveyed the area for the first edition of the map and the memoir. The recent revision of the area, while confirming many of the conclusions arrived at both by M'Laren and Sir Archibald Geikie, has led Dr. Peach to accept Judd's contention that the central agglomerate of the hill fills a vent which pierces the earlier volcanic rocks.

Petrographical and other evidence has also been forthcoming to uphold many of the views of the late Mr. Goodchild, who was certainly one of the most devoted students of the volcanic records of Arthur's Seat. It is now, for example, accepted that the sandstones beneath Salisbury Crags belong to the Upper Old Red Sandstone period, and are

not, as was suggested in the first edition of the memoir, of Carboniferous age. But one theory to which Mr. Goodchild latterly gave his support has not been substantiated by the latest evidence. The columnar structure of the Long Row, and the appearance of contact alteration, although very irregular, seemed to him to suggest that this prominent feature was an intrusive mass, a view which has found considerable support; but, on the one hand, columnar structure does not necessarily indicate an intrusive sheet, and, on the other, the Long Row furnishes no instance of the chilled margin which is generally accepted as an essential feature of intrusion. The official view, at one time shared by Mr. Goodchild himself, is that the Long Row is a lava flow, poured out from some vent outside the area of Arthur's Seat, but whose exact site cannot be precisely determined. We understand that the chapter of the memoir dealing with Arthur's Seat is to be issued along with the map as a separate pamphlet. The Geological Survey is to be congratulated on its enterprise, and if only a short introduction could be added, couched, if possible, in a little less technical language, and setting forth a few of the main facts that are essential to an intelligent appreciation of the problem presented by Arthur's Seat, the proposed publication would be of immense service, not only to the trained geologist but also to the ordinary reader, in whose mind it could not but stimulate an interest in the romantic story of the rocks.

As has already been suggested, the greater part of the volume concerns the geologist rather than the geographer, yet to the latter the brief but lucid surveys of the physical conditions at different epochs, and the excellent concluding chapters of the memoir, dealing with the recent deposits throughout the area and with the bearing of the geological formation upon the industries of the region, are of very great importance. The geographer will especially appreciate the publication of the new colour-printed map, itself a masterpiece of the printer's art, which for a very moderate sum can now be in the hands of every student. Now that the needs of the mining engineer and the geologist have been so adequately met, is it too much to ask that some direct attention should be given to the requirements of the geographer and of the agriculturist, for whom a map of the surface geology is urgently required? The many signs of progress in the present publications lead one to hope that before many years are over the Ordnance Survey and the Geological Survey may co-operate in the publication of a series of maps illustrating by means not only of the ordinary methods used in each survey, but also by a series of photographs, the direct relation between the topography of the country and its geological structure. Such a scheme was suggested on an international scale some years ago at the Geneva meeting of the Geographical Congress; but for regional purposes it could only be satisfactorily carried out by the local or national surveys. Such a scheme would do more than most to further the intelligent teaching and study of geography in our universities and schools; and the publication in such a cheap and available form of the geological map under review may be welcomed as a step towards this end.

GEOGRAPHICAL NOTES.

Europe.

The Origin of English Highways.—Mr. George Montagu contributes to the January issue of the *Sociological Review*, a journal just added to our list of exchanges, an interesting article on the highways of England. He points out that while London has a concentric position as regards the continent, it has an eccentric one in relation to England. It is at once the great receiving centre as regards continental traffic, and the great distributing centre for the United Kingdom. Along the great lines of communication which radiate out from London we find commercial cities and towns differing entirely from the agricultural towns which lie outside these zones. The author believes that the main lines of communication have been determined from the very earliest times by the position of the English ports. Roughly speaking, England and Wales form a five-pointed star, the important ports, or groups of ports, lying at the points of indentation of the star. These are London, Southampton, Bristol, Liverpool, and Hull, all corresponding to important estuaries. To these five main ports must be added Plymouth and Newcastle. At the present day all these towns are linked together by the main lines of the great railway companies. In pre-Roman days the lines of communication chiefly followed the rivers, which were connected by roads over ridges, or along the hillsides. The presence of the primitive forest was a great obstacle to the Britons, and its existence in the Midlands probably led to the independent development of the northern and southern parts of England. To the Romans the forest was no barrier, and they developed that wonderful system of roads of which traces still remain, and which corresponds roughly to the direction of the railway lines of to-day. Like the present railways the roads linked up the ports, and, as in the case of the railways, the method adopted was that of a main road with branches, and not of separate main roads as in the eighteenth and early part of the nineteenth centuries. The result was the production of junction towns where the roads branched, corresponding to the railway junctions of the present day. Silchester, where the main road to the west and south-west split up, was an example; Wall, near Lichfield, the junction between the roads to South Wales, the Severn valley, and the north of England, was another. As the Roman soldiers marched about eighteen miles a day, the Roman stations along the roads, except where special military conditions intervened, were one, two, or three marches apart, and such stations have frequently persisted as towns of to-day. Of important Roman stations which have now developed into similarly important railway centres, York, Doncaster, and Carlisle are good examples. After the Roman period, and with the decay of the roads, settlements on navigable rivers began to reacquire the importance they had had in the early days, on account of the facilities for communication which the rivers offered. Thus it is noticeable that practically all the cathedral cities lie on navigable rivers, while many rich abbey towns have a similar position.

In Roman days the navigable rivers supplemented the roads, but later they became the chief means of transit.

Italian Committee for the Investigation of the Sea.—A Committee for the investigation of the Sea was appointed in 1909 by the Italian Society for the advancement of Science. It did such good work that a few months later it was established by law in the Italian Parliament, under the name of the *Regio Comitato Talassografico Italiano.* Its objects are to investigate the Italian seas from the chemical, physical, and biological points of view. Great importance will be attached to practical questions relating to navigation and fisheries, while investigations of the upper atmosphere will also be made in connection with airship navigation. The President of the Committee is the Minister of Marine, and representatives of the chief Institutes, Academies, and Societies which interest themselves in the investigation of the sea have been appointed as members. In addition, the Committee has a scientific staff of its own, and receives a yearly subsidy of 60,000 lire from the Italian Government, which also supplies ships for the cruises from the Italian Royal Navy. Four cruises in the Adriatic have already taken place, and a fifth will start directly. In carrying out these cruises a programme has been agreed upon with delegates of the Austrian Government.

The Condition of Southern Italy.—In the *Diplomatic and Consular Reports* for 1910, there appears a report on the commerce of Southern Italy, which gives a somewhat gloomy account of the region. In 1906 a Parliamentary Commission was appointed in Italy to inquire into the condition of agricultural labour in Southern Italy, and this commission is now issuing its reports. In the *Consular Report* referred to above, these reports are freely quoted from, and we may indicate briefly some of the facts which they contain. We take the case of the province of Calabria as typical of the area. This province is predominantly agricultural; pastures are numerous in the highlands and also near the coast, while in the intervening areas, cereals, the olive, vine and citrus fruits are grown. Of the land capable of irrigation less than half is actually irrigated, mostly with well-water. Two-thirds of the population are engaged in agricultural pursuits, while the remaining third is engaged in industry, especially silk-weaving. Agriculture is carried on by very primitive methods; there is practically no modern machinery, and manures are hardly used. The land is sown with grain for two years in succession, and is then allowed to lie fallow for two years. Insect and other pests are numerous. Thus the vines are affected with phylloxera, the olive with the olive-fly, the citrus with a bug, and so on. Of the total population of 1,370,000, more than half are believed to be more or less infected with malaria, while tracoma is common and tubercle fairly frequent. A considerable amount of silk is produced, but by primitive methods, *e.g.* the women incubate the eggs of the moth by body heat. In 1901 nearly 80 per cent. of the peasants were found to be illiterate. Further, in the Abruzzi and Molise it has been found that

children, taught to read and write, later relapse into illiteracy. In 1907 the emigrants from Calabria numbered 47,000, and here, as elsewhere in the south, only a small proportion return to their native land. In consequence, agricultural labour is becoming scarce, and therefore wages are rising. In Calabria, as in the south generally, the great need is a further diffusion of education and the adoption of modern methods of agriculture.

Asia.

The Evolution of the Relief of Central Asia. — Prof. E. de Martonne contributes to *La Géographie* for January 15 an article upon this subject, in which he summarises the observations and conclusions of the many explorers and travellers who have recently visited this region.

He begins by summarising the views of Suess, already tolerably well known. Briefly put, it will be remembered that this geologist regards the great chains of Central Asia as occupying an area which once formed the basin of a large midland sea—the Tethys. This sea lay in a geosynclinal between two very ancient continents, Angara to the north and Gondwana to the south. Movements of elevation united these two separated continents, and formed the present continent of Asia, consisting of a great central mass of mountains bounded to the north (plains of Siberia), and south (plains of Arabia and India) by regions of tabular structure forming a series of plains and plateaux. The formation of the continental mass took place in two stages—a folding of primary age restricted the breadth of the Tethys sea and formed the chain called by Suess the Altaides (from the Altai). After a long period of repose the mighty folding which to the west produced the Alps, Pyrenees, etc., finally suppressed to the east the Asiatic Mediterranean, and produced the Himalayas and adjacent chains.

In Prof. de Martonne's opinion these great generalisations of Suess's, masterly as they are, cannot be regarded as completely satisfactory to the geographer, for they do not explain the two facts in regard to the structure of Asia which are the most important to him—the extent and age of the interior drainage basins without outlet to the sea, and the fact that folded mountain chains of primary origin have retained their primitive high relief, instead of being worn down to plateaux, as has occurred elsewhere. He, therefore, collates the results of recent exploration, and seeks in it an explanation of these two great facts.

He notes, first, that since the publication of the *Face of the Earth*, two new conceptions have been acquiring more and more importance in the eyes of geographers. These are the notion of "cycles of erosion," and that of the occurrence of "epeirogenic movements." The first of these requires no explanation. In regard to the second, we may note that orogenic movements are recognised by the production of obvious local dislocations and folding in the strata forming the crust of the earth. Epeirogenic movements are those in which vast areas of the surface undergo elevation without any necessary dislocation of the beds. Suess denies the existence of such movements, preferring to interpret the facts as the result of changes of sea-level, or of a letting down of blocks of the

crust. Prof. de Martonne believes that the reality of epeirogenic movements cannot be questioned, but believes also that they succeed as a necessary consequence to the orogenic movements, forming a kind of reaction due to an as yet unknown mechanism.

Without following him into the details given of the work of the various recent explorers, we may note concisely that observations in the Tian-Shan and in Fergana on the one hand, and in North China on the other, tend to show that the existing relief in these regions is secondary, and is due to an elevation occurring after the original chain of primary origin had been reduced to the condition of a peneplain by long-continued erosion. Not only this, the Himalayas themselves, though only of tertiary origin, were apparently so modified by the forces of erosion as to be reduced by the end of the Pliocene to the "mature" condition. Epeirogenic movements of Quaternary origin, still in operation, which took place throughout the whole of Central Asia, but were strongest to the south, caused a renewal of erosive activity, and superimposed a new cycle of erosion upon the old one. Thus the present relief of Asia is due much more to recent vertical movements than to folding. The folding, whether primary or tertiary, explains the orientation of the chains, but not their relief. The quaternary movements are still affecting the Himalayas which have not yet "begun to decay."

It is these Quaternary movements, accompanied by bulging, warping, and sinking of land areas, which have led to the formation of basins of interior drainage in Asia, and thus to the production of desert and steppe areas, which have in their turn so profoundly affected the distribution of life in the northern hemisphere. These interior drainage basins, with their peculiarities of climate, have divided up the once continuous biological province which extended from the Atlantic to the Pacific, from Portugal to Japan. The basins have given origin to special types of animals and plants which have gradually spread themselves over Eastern Europe. They have similarly given origin to special human groups which have always constituted a menace to the advanced civilisations, necessarily peripheral in position. The formation of these interior basins has been going on in Asia from the very earliest times. After the formation of the Altaides the waste of these mountains poured into the narrowed Tethys, and formed the sediments which later were folded and elevated as the Himalaya. With the elevation of these mountains the Tethys sea finally disappeared, and the menace of desert conditions begin to hang over Asia. The relatively damp climate which prevailed till the Quaternary period permitted the peripheral streams to extend their catchment areas towards the interior, and to fill up some of the interior basins. But by the elevation which took place in Quaternary times the mountain rim became better marked, the basins more distinctly cut off from the margin, and the development of the Asiatic deserts, with all their consequences, definitely began.

Africa.

East Africa Protectorate.—The annual *Colonial Report* for 1909.

1910 gives some interesting details in regard to this colony. In the financial year 1909-1910 the imports showed a decrease of nearly £22,000 as compared with the previous year, while the exports increased by £150,000, the increase being most marked in the case of hides and skins and rubber. The latter increase is due to the increased collection of wild rubber, the plantation rubber not having been touched yet. The increase in regard to hides and skins is less satisfactory in that it is partly due to the great prevalence of cattle disease during the year. The exports of cotton have diminished, the attempts at cultivation having proved a failure. This, however, may be due to the fact that it has hitherto only been attempted near the coast: it is stated that there is good prospect of success if cultivation is seriously undertaken on lands adjacent to the Juba and Tana rivers.

In addition to details in regard to land development, trade, commerce, etc., the *Report* contains some interesting notes in regard to the natives. Thus it is stated that the cattle of the wholly pastoral Masai are greatly increasing, owing to the attempts made by the Government to put down cattle disease. As this tribe refuses to trade in cattle, the consequence of the increase is that its members tend to overflow from their reserves into neighbouring territories — hence naturally much friction. Another difficulty, especially with the Akikuyu and Akamba, is the existence of native Christians who form a state within a state, and are not bound by native law as regards marriage, divorce, inheritance and so on. This results in the weakening of the power of the chiefs, and may give rise to grave difficulties, as all the tribes hold their lands under communal conditions. The Masai have as yet been little influenced by the various mission bodies.

America.

Studies of Glaciers in Alaska.—We are informed that the Research Committee of the National Geographic Society of Washington has made an appropriation of $5000 for continuing the glacier studies of the two previous years in Alaska. The work, which is to begin this month (June), will be done by Professor R. S. Tarr of Cornell University, and Professor Lawrence Martin of the University of Wisconsin, who directed the National Geographic Society's Alaskan expeditions of 1909 and 1910 in the Yakutat Bay, Prince William Sound, and lower Copper River regions. The 1911 expedition will study briefly a number of regions of glaciers not previously investigated by the National Geographic Society, although partially mapped by the Alaska Division of the U.S. Geological Survey, the Boundary Commissions, etc. Work will be done on the present ice tongues, and the results of glaciation in the mountains and plateaus of parts of the interior and some of the fiords of south-eastern Alaska, the former having lighter rainfall and smaller ice tongues than the Yakutat Bay and Prince William Sound regions.

Polar.

Japanese Antarctic Expedition.—The *Kainan Maru*, the ship of

this expedition (cf. p. 151), put into Sydney Harbour on April 30, the expedition having been abandoned. The ship encountered very heavy pack on her voyage southward, and was not able to penetrate further south than Coulman Island, off Victoria Land, the original attempt to reach the coast of Edward VII. Land having been given up. After cruising about off Coulman Island for a few days, she returned northwards, the leader being influenced in his decision to abandon the attempt to land by the death of almost the whole of the dogs which were to be used in drawing the sledges.

The German Antarctic Expedition—The *Deutschland*, the ship of Lieut. Filchner's Antarctic expedition (cf. vol. xxvi. p. 262), left Bremerhaven on May 8 for Buenos Ayres and the south. Lieut. Filchner's proposed route is indicated on the map on p. 263 in vol. xxvi., where it will be seen that he intends to start from the shore of the Weddell Sea, and attempt to make a traverse of the Antarctic Continent to Victoria Land.

Wireless Telegraphy Station in Spitsbergen.—The Norwegian Government has resolved to establish a wireless station in Spitsbergen, as well as another at Hammerfest. It is hoped that the work will be completed this year, the proposed site being Green Harbour. The station will be kept open all the year round, and will be in charge of three or four men. The distance from the Hammerfest station will be 750 miles.

General.

Drainage Systems and Undrained Areas.—Herr Ewald Banse contributes to *Globus* for September 1 of last year (vol. xcviii.) an interesting article, illustrated by a map, upon the drainage systems and undrained areas of what he calls the Orient. He gives this name to the area which stretches from 17° 5′ W. long to 71° 35′ E. long, and from 42° 9′ N. lat. to 12° 38′ S. lat., and thus includes the northern part of Africa, Arabia, Turkey in Asia, Persia, etc. Within the area so defined lies a smaller area over the whole of which the mean annual precipitation is less than 8 inches per annum. This area, which includes the Sahara desert, the Arabo-Syrian desert, and the Irano-Armenian desert, forms the largest arid area on the surface of the globe. It is bordered in the southern Sahara and in the northern part of Asia Minor by an area where the mean annual fall is nearly 24 inches. During winter the prevailing air currents blow from cooler to warmer regions, and, therefore, precipitation only occurs in the presence of considerable elevations, *e.g.* in the Atlas, the hill regions of Asia Minor, northern Persia, etc. In summer the region becomes one of the most intensely heated regions of the globe, and the north-south winds of the northern border render precipitation impossible. On the equatorial border the summer winds are south-north in direction, and thus the Southern Sahara and South Arabia have summer rains. This vast arid area forms a

natural barrier to the distribution of animals and plants, and is itself the home of the Arabian peoples, the one-humped camel, and the date palm.

Within the area two natural regions can be distinguished—the marginal zone drained by rivers and water-courses which reach the sea, and the central region which has no direct connection with the ocean. As already suggested, the central region can be divided into three great divisions, the Saharan region comprising 46·4 per cent. of the whole, the Arabo-Syrian forming 15·3 per cent., and the Irano-Armenian 12·3 per cent. Throughout these regions the phenomena of erosion are very different from those seen in non-arid lands. The tendency is for flat plains to be produced, and wind is the most important factor in the process of erosion. As the normal forces of erosion tend to produce such a plain, the deserts may be said to form a portrait of what the earth would be if no earth movements occurred to modify the normal course of erosion. They are necessarily very unsuited to human activity, and are thus associated with low grades of culture and small populations.

Very different is the portion of the area which has constant or periodic streams draining into the sea, and lies round the desert regions. In some places this marginal zone forms the merest border on the sea-coast; elsewhere, as in Southern Nubia, Southern Morocco and Southern Tripoli in Africa, and in Eastern Anatolia and Western Armenia in Asia, it reaches a considerable width. These favoured areas have been regions of origin of high stages of civilisation, *e.g.* of the Sumerian civilisation in the Anatolian-Kurdic belt. The peripheral area can itself be divided into two zones—that with perennial streams, and that with temporary streams only, the former being associated with the higher stages of culture.

The author then considers the area comprised in his term Orient under four headings—the Atlas lands, the Sahara, south-west Asia, Asia Minor and the adjacent regions. For each of these regions tables are drawn up giving the total area, and also the percentages of the total which are undrained, or drained (*a*) by temporary, and (*b*) by perennial streams, and the density of the population. From these it appears that the density of the population varies with the amount of land having perennial streams. In the Atlas lands the area which has perennial streams is largest, and here the population is densest. In the Sahara the proportion of undrained land is greatest, and here the population is scantiest, and the region, according to the author, is destined to remain the great stronghold of Islam in Africa.

Commercial Geography.

Rubber Collection on the Amazon.—A short article in the January issue of the *Bulletin* of the American Geographical Society gives some interesting facts in regard to the rubber industry in Brazil. In the State of Amazonas, excluding the town of Manaos, some 150,000 men are employed in the rubber industry. An average estate extends as a narrow band on both sides of the river, and is some 50 to 75 miles long. As the trees only grow on the river front, each estate

only extends two or three miles into the forest. The headquarters are placed centrally, and the camps of the workers are scattered through the estate, with which they communicate only by water. The workers are paid according to the amount of rubber collected, but they are obliged to obtain all stores at the office, with the result that they are often enormously in debt to the firm. The weather greatly affects the collection of the milk, and fever is very prevalent among the workers. Once a month a launch comes up the river with stores and takes the rubber down, this being the only means of communication. In the case of a particular estate described the money received from sales of rubber is 200,000 dollars per annum, while 60,000 dollars are paid in wages. Of this, however, nearly 25,000 dollars are re-obtained in profits on the stores sold to workers. The stores are retailed at prices which are three to five times those obtaining in Para, and sometimes ten times those obtaining for similar goods in New York. Steady and industrious workers, provided they can obtain part of their food by shooting and fishing, can sometimes save money, which is then usually spent in a short carouse at Manaos.

Railways in Russian Asia.—A note in the *Revue Générale des Sciences* gives some details in regard to extensions of the Russian railway system in Asia. A credit has been voted for the completion of the railway from Khabarovsk, at the junction of the Amur with the Usuri, to Sryetensk on the Shilka. The completion of this line will ensure to Russia communication with the Far East entirely within her own territories. Meantime communication between the two places named is effected by steamers on the Amur, which travel only during the day, and take nearly a fortnight to complete the journey, a distance of about 1300 miles. The second great piece of work to be undertaken is to connect Petersburg direct with the Trans-Siberian route, instead of, as at present, *via* Moscow. The new route will pass *via* Viatka, Perm, and Ekaterinburg to Kurgan, and will shorten the route to the East considerably. There is also a proposal to prolong the line from Pekin to Kalgan, already constructed by the Chinese across the Gobi desert, *via* Sair-ussu and Urga to Kiakta at the south of Lake Baikal. This would bring Paris within nine and a half days of Pekin.

EDUCATIONAL.

The Teaching of Geography.

The Report[1] of the Conference of Teachers organised by the London County Council has now been issued, and it deserves to be carefully considered by all who are interested in Geography as a school subject. The list of members of the Conference includes such well-known names as

[1] *London County Council. Report of a Conference on the Teaching of Geography in London Elementary Schools.* Printed for the London County Council, 1911. Price 1s.

those of Mr. Chisholm, Lecturer in Geography in Edinburgh University; Professor R. A. Gregory, assistant editor of *Nature*; Dr. Herbertson; Dr. J. Scott Keltie; Professor Lyde; Messrs. Taylor and Unstead; several headmasters and headmistresses of London County Council Schools; while Mr. Peck, now Clerk to the Edinburgh School Board, was chairman, and Mr. Furness, of the L.C.C. Education Officer's Department, secretary. The Conference was thus representative of the teaching profession from the Primary School to the University, of the writers of text-books, of administrative authorities, and of the Royal Geographical Society, the pioneer in the modern development of geography teaching.

In an Introductory Note by the Chairman, two points of criticism are anticipated. He says:—

"The educationist, who had his eye on the curriculum as a whole, may reprehend this report as being the work of specialists, who would make their subject eclipse all other subjects in an already overcrowded syllabus. To this, it need only be replied that the commission given to the Conference was to report on Geography, and that competition and survival will no doubt operate healthily in the school curriculum as in other things.

"Lastly, it may be said, that many of the methods indicated are too ambitious for the primary school. It has been thought well, however, to err on the side of elaboration: for the report is essentially suggestive and in no way aims at prescription. All teachers, it is hoped, will find help in some of the chapters towards the solution of their special problems, and to a few the complete study presented may be a stimulus in the teaching of a subject which unites many of the elements essential to a full education."

The Report itself consists of seventy-four pages, divided into twelve chapters. The first chapter gives an historical account, beginning with the report submitted to the Royal Geographical Society in 1885. In Chapter ii. "Existing methods" are outlined, and those are divided into two classes—the "predominantly literary and the predominantly scientific." The former is described as relying mainly upon books, or upon the imagination in the best sense of the word: the latter upon things, or upon observation. Reference is made to school excursions, the use of lantern slides and stereoscopic views, museum visits, pictorial post-cards, scrap-books, and other aids invented by the ingenious and enthusiastic teacher. Chapter iii. gives a statement of the special difficulties to be faced in London. The number of children in the various schools under the Council is close upon three-quarters of a million, more than in the public elementary schools of Scotland, or in the whole of Australia. Then there is the fact that most of the children, and even many of the teachers, have practically never been outside their own city. The size of the classes (usually about sixty pupils) is another difficulty, which, however, is not peculiar to London. It is noted as satisfactory for the future, that in all new schools no class-room will accommodate more than forty. The social condition and physical environment of a large proportion of the children are also great hindrances. In connection with the training of teachers it is clearly pointed out that the teacher must be a

specialist. The old idea that anybody on a staff, and preferably the weakest member of it, can teach geography, may surely be now regarded as dead. This principle is fairly well recognised in many secondary schools, but we fear that most public educational bodies will take some time before applying it to elementary schools.

Chapter iv. treats of "General Considerations on Method in Geographical Teaching." The statement that the child should begin with Nature Study will meet with general agreement. But we should be inclined to give to that term a wider meaning—which perhaps would be better indicated by another term—than is given in the Report. It is a common saying that the city child, and especially the London child, is at a great disadvantage in this respect compared with his country cousin. But we are not at all sure that this is really the case. Nature Study so-called is not an end in itself. It is, like Geography, or Mathematics, or Latin, part of the means used for making a child a useful citizen. To our mind, therefore, it is essential to avoid any "hothouse" treatment. The pupil must not be dragged out and compelled to see things. So the child should not be "taken" on excursions beyond his own immediate surroundings, *i.e.* what he can see for and by himself, until he has advanced well beyond the beginner's stage. We do not wish to elaborate this, nor indeed is it necessary, for in the Report there is, of course, absolutely no suggestion of actual forcing; but our point is that if the best is made of the school and its neighbourhood, however unfavourable, the connection between the observational and the imaginative methods will not be so difficult. The city child will always realise well conditions in other cities, the country child will be able to appreciate conditions in other rural districts.

Interesting and valuable hints are given as to the correlation at a later stage of the concrete with the general method. A railway station suggests routes to other parts of the country, a harbour or docks will lead to thoughts of other lands. Maps will come in even at an early stage, beginning with a plan of the neighbourhood. Rough map-drawing from memorised latitudes and longitudes will be practised. A large globe will be used constantly as a corrective, and in illustrating the rotation and revolution of the earth. Text-books, unless they are good geographical readers, are not recommended in junior classes.

Chapter v. enters into a detailed description of a course for children of from seven to ten years of age. It may be outlined thus—The sun, sunshine, shadows, direction; plan-making and drawing to scale; the weather, winds, clouds, rainfall; change of season; local observation, streets, objects in shop windows, the Thames. Then stories should be told illustrating geographical conditions in other parts of the world: *e.g.* coral islands, and adventures by land and sea. Five courses are then given, four with general information as to the world, one of the British Isles. Each is to be illustrated with lantern slides, pictures, models, etc., and a large globe, each child having a smaller one.

Chapter vi. extends the method to older children (from 10 to 13 years). They are now prepared to study more intensively the effect of climate on plants, animals, and occupations; the varied character of

land surface, with the results of weathering and erosion: the nature of the soil derived from different rocks: the weight and temperature of the atmosphere. The continents may now be attacked by the help of flat maps. The use of contour lines may be learned, leading up to a study of means of communication. The climate of other regions may be compared with our own, leading to the question of drainage, by taking large rivers in different climatic regions. Food supply is also dependent upon climate, but we object to the abrupt transition from agriculture to minerals. The latter will naturally come under the next heading, that of the distribution of the population. Detailed study of smaller areas will lead to a consideration of political boundaries which brings out one of the few points of connection between geography and history. Here large scale ordnance survey maps may be introduced.

In Chapter vii. we have a detailed statement of method in Higher Elementary and Higher Grade Departments (age from 13 to 16). Here a further development of intensive teaching may be undertaken both in outdoor work and in the study of some region. Weather records will be kept in correlation with science teaching. The great natural regions of the world will be considered, especially with regard to rainfall, and a beginning may be made in estimating the influence of the gradual extending of geographical knowledge. The pupil will learn how to fix in his own mind the general features of a region by constructing maps with the help of home-made instruments. The reading of ordnance survey maps will be extended. Finally, the connection will be made with the human element by studying the origin and influence of scenery, and the flora and fauna, in relation to the people and their occupations.

Chapter viii. discusses the relation of Geography to other subjects of the curriculum. Here we must repeat that each district, we should almost say each school, must have its own course of "Nature Knowledge."

The Report points out quite clearly that much of what is taught under the head of Experimental Science consists of isolated experiments such as the construction of a barometer. Now it would be much better to teach a child to make a chair, an article which he knows how to use, than to have him make a barometer, unless he also gains some conception of its utility. Even that is of practically no value unless he learns something of climate and its place in Geography. There is a distinct danger of setting up Nature Knowledge and even—let us whisper it—Geography as a fetish. Geography as a school subject is in its infancy. Its teachers have a great opportunity of proving its value as a truly educational subject. Let them avoid the fatal error of placing it in the grinding department of the old-fashioned scholastic mill.

Then comes the vexed question of the connection between Geography and History. Why those two subjects are so commonly placed in conjunction is a mystery to us. It must simply be a survival of the dark ages. They both treat of man, and they are both taught (in this country) in English. The same may be said of anthropology and political economy, but so far no one has thought of bracketing these subjects together for examination or any other purposes. One might as well couple Latin and Botany on account of the terminology of the

latter. The Report well states that Geography deals with man in *space*, History with man in *time*, but the whole treatment suggested seems to us purely historical. The real fact is that the teacher of Geography does not require to know as much of History as he should know of Meteorology, Geology, Astronomy, and several other subjects.

Chapters ix. and x., treating of Equipment and Apparatus, Maps, and Lantern Slides, may be strongly recommended for the perusal of the practical teacher. The suggestions are extremely exhaustive and elaborate, and may be regarded as an ideal to be set before the powers that be. We are glad to notice in passing that the "use of the globes" is not too much emphasised. For most practical purposes the earth may be regarded as a flat surface, therefore ordinary atlases and wall-maps are the chief parts of geographical equipment; the globe is, in the main, merely a corrective.

Chapter xi. opens up the crucial question of examinations. We have nothing but commendation here, and we can only hope that examiners will carefully study not only this section, but the whole report. It must be extremely discouraging to teachers and pupils to be criticised by one who is totally ignorant of the subject. There are honourable exceptions, but it is of course inevitable that there should be some lagging behind the times. It is also disheartening to a teacher who has conducted his classes on modern lines, to find certain written examinations as set by outside bodies composed of questions conceived in the old-fashioned spirit. No doubt this will be remedied in time.

Chapter xii. deals with the training of teachers, and its suggestions will doubtless be considered by training-college authorities. It is obviously hopeless to expect geography to be properly taught without a supply of qualified teachers, and to this end it should be a recognised subject in these colleges and in universities.

In conclusion, we should like to state that we have examined the Report with great pleasure, and we feel sure that it will be generally regarded as a valuable compendium of the modern scientific methods of teaching Geography. T. S. Muir, M.A., F.R.S.G.S.

NEW BOOKS.

EUROPE.

The British Isles: Geographical Diagrams and Land Forms, with Questions, Statistics, and Tables. By H. J. Snape, M.A. London: Adam and Charles Black, 1911. *Price* 1*s.* 6*d.*

This book consists of three parts; a collection of diagrams and maps, a large series of statistics, and a number of views of British scenery. Those of the diagrams and maps which have been taken from recognised books of reference will be found very useful, many of the others seem to us to illustrate the need of very accurate and detailed knowledge before the graphic representation of facts is attempted. We should like to have an example of a tropical mountain showing the zones of vegetation marked in the diagram given here, and the diagram of the zones of vegetation on the western sides of continent is obviously incorrect, for it

inserts a zone of steppes between the deciduous forests and the deserts to the south. Steppes would be impossible here as there is no summer rain to promote the growth of grass; the region is, of course, characterised by its evergreen scrub with xerophytic characters. We think also that the author would be well advised to give a somewhat detailed study to the geological diagrams which appear in the standard works on the subject, before the issue of a second edition.

The series of views contains some fine examples, although we do not think that the questions asked can always be answered from inspection of the pictures.

Mediæval Sicily: Aspects of Life and Art in the Middle Ages. By Cecilia Wærn. 73 Illustrations and 7 Plans. London: Duckworth and Co., 1910. *Price* 12*s.* 6*d. net.*

At a first glance the artistic side of this handsome volume appears the most important, and undoubtedly Miss Wærn writes here with special ease and enthusiasm. But its peculiar value will be found to lie rather in the full citations from mediæval authorities, of whom the Arabian are the most valuable. It was in the period when Arab civilisation was pre-eminent that the island flourished under the sway of that people, and quaint and wonderful are the delights which are chronicled by their old writers. It is an aim of the authoress to show how much the civilisation of the country owes to the East, although the survivals from Pagan times receive attention also. Several details of these are new to us, and, in particular, the foods appropriate to certain festivals of the Church, which belong unquestionably to much earlier festivals.

Architecture receives full treatment, and the descriptions of decorations reveal the writer's keen sense of colour, as when telling of that choice gem, the Cappella Palatina. The great Cathedral of Palermo was, by the way, the work of an Englishman. Much scholarly information upon manners and customs has been included, and a personal note adds to the attraction of the writing. A certain amount of repetition occurs, and the numbering of the pages causes the reader an occasional halt. But these details are of small moment in the volume, which is a genuine contribution to our knowledge of the island. The photographs reproduced are as good as can be.

Siren Land. By Norman Douglas. London: J. M. Dent and Sons, Ltd., 1911. *Price* 6*s. net.*

In this volume we have a series of essays, or we might, perhaps, call them soliloquies, on subjects evoked by the legends, traditions, and historical associations connected with Siren Land, *i.e.*, Capri and the extreme south of Italy. There is no attempt at sequence or order. The writer himself says, "Were I writing a guide-book or historical account of this region, I would endeavour to give a systematic description of these legendary islets, supplemented with measurements and hints for travellers. But I am doing nothing of the kind; I am only dreaming through the summer months to the music of the cicadas, and dreams are irresponsible things that flit about aimlessly, dwelling with absurd gravity upon unconsidered trifles, and never quoting statistics." He is evidently well versed in the literature of his subject, as well as familiar with its present condition. At one time he entertains his reader with a skilful laudation of the Emperor Tiberius, at another with a generous if somewhat sarcastic account of Sister Serafina, showing the curious and suspicious parallelism of the events recorded of her with those recorded of the Spanish Saint Teresa. At times his lucubrations seem very much spun out and a trifle wearisome, but the book will serve to pass a lazy hour, and

will be read with interest and profit by any who are acquainted with the locality with which it deals.

Florence Past and Present. By the Rev. J. Wood Brown, M.A. London: Rivingtons, 1911. *Price* 6*s.*

The word *rat* is derived from the Latin *mus*, for one must first have said *mus*, then *murus*, then *muratus*, then *ratus*, then *rat*. So, we are told, says Menage, and there is a good deal of the reasoning in the first chapter of this volume perilously like this, which may create a prejudice against it in some minds. It is to be regretted, for the volume is in some respects a notable one, which will appeal especially to those who delight in new ideas even when resting on somewhat slender foundations. The main idea of the book is to indicate in the life of the Florence of modern times down to the present day survivals from and influences that can be traced back to ancient and even prehistoric times; and the volume has at least this merit that the author has the power of making himself interesting if by nothing else than the contagion of the interest he feels himself. But there is more than that in it. The author is widely read in the classical, Italian, and other literature relevant to his subject, and has a keen appreciation of the force of evidence where evidence is available, even although, where that fails, he is ready enough to take big leaps of conjecture. Geographers will find several chapters, particularly those on Early Trade, the Site and its Power, and the River Trade, specially interesting and instructive, but unfortunately there is a lack of adequate maps. The author writes as if he had only English readers resident in and familiar with Florence and its environs in his mind, but he may be assured that his volume will be welcomed by a much wider range of readers. For them, however, a plan of the city and a good map of the environs showing the physical features on a sufficiently large scale to let us see how the plan fits into the map of the environs are a necessary supplement for the following of the text. The outline maps supplied are not enough.

Regilding the Crescent. By F. G. Aflalo. London: Martin Secker, 1911. *Price* 10*s.* 6*d. net.*

Mr. F. G. Aflalo is already well known to our readers as the enthusiastic and experienced exponent of "the gentle art of fishing" and sport generally (*vide S.G.M.*, vol. xxiv. 51, xxv. 384), in various parts of the world. But in this volume he comes before us in a different rôle. He is now a student of contemporary history and a politician; and the object of his study is "the sick man of Europe," *i.e.* the Sultanate of Turkey. In this intensely interesting work he attempts to give "some idea of the races, religions, and politics, of the resources and difficulties, which are of supreme interest in the working out of Turkey's salvation. Among the essential reforms discussed are the divorce of the Koran from the Statute Book, the crying need of more liberal education, the exclusion of army officers and priests (or their equivalent in Islam) from the arena of politics, the emancipation of women, the financing of public works, the development of Anatolia, the maintenance of friendly relations with the Powers and with lesser neighbours, and the pacification of outlying provinces." It is obvious that his subject is outside the scope of this *Magazine*, but we must add that he deals with it in a masterly and adequate fashion, the result of careful study on the spot of all the conditions, an exhaustive study of which is essential for the framing of an impartial and well-balanced judgment on a complex and difficult problem. At a time when the signs of "unrest" are so marked both in the Near as well as in the Far East, an "unrest," in which the Mahommedan factor is bound to play an important part, Mr. Aflalo's lucid and impartial statement of the history and motives, the

successes and failures, the opportunities and the dangers of what is known as the Young Turk movement is well timed, and worthy of study by the general reader as well as the statesman, the politician, and the philanthropist. The problem before the Young Turks is how to reconcile and accommodate the stagnant and obsolete system of the Koran with the actual conditions of the twentieth century. It is easier to state the problem than to solve it. We cordially commend this book to the perusal of all our readers.

The Book of Buchan. By Twenty-nine Contributors. Edited and arranged by J. F. Tocher, B.Sc. Peterhead: The Buchan Club, 1910.

This portly volume is divided into six sections, and treats in detail of the natural history of Buchan, of prehistoric man in Aberdeenshire, and of the history of the north-east of Scotland in ancient, mediæval, and modern times. Of the papers of special interest to us we may note an interesting one on *Botanical Surveying* by Dr. Rudmose Brown, valuable to the geographer, though its relationship to the subject of the volume is not very close. Both this paper and Professor Arthur Thomson's on the fauna of the region seem rather to point out pieces of work the members of the Buchan Club might undertake, than to summarise what is known, as do most of the other papers. A concluding chapter on *Agriculture in Buchan* by Mr. R. B. Greig gives a very instructive account, with historical notes, on the present condition of the agricultural industry in the region, and various other papers in the same section (*Modern Buchan*) throw much light on social and other conditions here.

Cities of Southern Italy. By Augustus J. C. Hare. Edited by St. Clair Baddeley. London: William Heinemann, 1911. *Price 5s. net.*

This handy little volume has prefaced to it an introduction by the late Augustus Hare, the author, in which he says that he has an uncomfortable sensation that few will read his book, and fewer still use it on the spot, because the English-speaking traveller rarely ventures further south on the mainland than the vicinity of Naples. But it must be admitted that the author's own accounts are likely to check the ardour of the intending tourist. On the west side of southern Italy, he says, mere comfort may be said to cease altogether at Salerno:—"Thenceforwards, the trains crawl Sicily-ward through the ugly but sometimes very grand country, and loiter, without the slightest apparent object, at small wayside stations, to which the ragged, cursing, begging population is freely admitted. . . . The inns are miserable, and sometimes are swarming with insects; the beds are damp; the food is scanty, and except at Bari, Reggio, and Cosenza, sanitary arrangements are unknown. No words descriptive of wretchedness can portray the utter degradation of the peasantry in these southern provinces, or the way in which large families are huddled together, with their pigs and fowls, eternally unwashed, and covered with vermin, to which in time they become impervious, like the beasts themselves." We rather doubt the literal accuracy of the last adjective, but in any case is it thus that the travelling Englishmen is best drawn southwards?

The gloomy tone recurs somewhat frequently throughout the book, and though at times author, or editor, becomes eloquent with regard to the beauties, natural or architectural, the net result can only be regarded as a little depressing. Those who are brave enough to face the difficulties and dangers to health so vividly depicted will, however, find in the book all the details they need. It is illustrated by photographs and sketches, and also by a map of southern Italy, and plans of Naples and Pompeii.

Swiss Mountain Climbs. By GEORGE D. ABRAHAM. London: Mills and Boon, 1911. *Price 7s. 6d. net.*

This beautifully illustrated book appeals primarily to the expert climber, who will find in addition to the photos a series of outline drawings showing the principal peaks and their routes. But Mr. Abraham does not wholly neglect those who cannot call themselves more than good walkers, and gives many notes upon excursions within their reach. For the true climber much valuable information is given, and the neat *format* of the book, with its blank pages for memoranda, will especially appeal to him. As already suggested, and as one would expect from Mr. Abraham, the photographs are magnificent. The book is divided into four parts; an Introduction on Swiss Mountaineering, followed by discussions of the Bernese Oberland and neighbouring regions, of the Pennine Alps, and of the Bernina Alps, with some outlying centres, such as Engelberg, the Diablerets region, etc. The author's enthusiasm is such that his descriptions may be read with interest even by those who have no desire to follow his example and risk their lives on the precipices of the Alps.

The Bernese Oberland, in Summer and Winter: A Guide. By JULIAN GRANDE, F.R.G.S. (Member of the Swiss Alpine Club). With Illustrations and Maps. London: Thomas Nelson and Sons, 1911. *Price 3s. 6d. net.*

This is a capital little guide-book, which gives full details both in regard to the summer and winter seasons in the Oberland. Details in regard to the latter have hitherto not always been easy to get, especially as the number of places with a winter season is constantly increasing. The book is especially intended for the active visitor, and gives much useful and practical information about winter sports, costume and equipment in summer and winter, climbs and excursions, and so forth. There are also chapters on the history, flora and fauna, geology, etc., of the Oberland. We note in the chapter on the flowers that it is stated that Switzerland has no autumn crocus. The statement is doubtless true in the technical sense, but the autumn colchicum is so commonly called autumn crocus, and is so abundant everywhere, that some modification of phraseology seems advisable. In addition to some good illustrations there are a number of very useful maps. We recommend the book to the notice of intending visitors to the Oberland.

ASIA.

Shans at Home. By Mrs. LESLIE MILNE. London: John Murray, 1910. *Price 15s. net.*

By the fall of King Thebaw and the capture of Mandalay in 1886, the Shan States, which are situated roughly in the north of Upper Burma, south of Assam, and west of Yunnan, came into the hands of the British, and for the first time for centuries the inhabitants had a chance of peace and prosperity. The Rev. Mr. Cochrane, who contributes to this work two interesting chapters on the history and literature of the Shans, says quite accurately, that when annexed by the British, "they were in a condition of social and political confusion, little short of utter chaos. Burman interference, exactions, oppressions, and general misrule for three centuries had reduced the country to the lowest stage of calamity it had ever known. Robber bands infested the land; no one dared to leave his house unarmed; thousands of Shan families fled into the Chinese Shan States or to Lower Burma which was under British rule. Walled towns were in ruins; the inhabitants of the villages had fled from their burning houses; thousands of acres of cultivated lands returned again to dense jungle; excessive tolls had cut off the trade with Burma, except where a caravan might pass by unguarded

ways: the high lands were fast becoming depopulated, and the people that remained had no incentive to work for fear of the tax-gatherers." The tyrant Thebaw fell, and then ensued twenty-four years of the Pax Britannica, which has worked a remarkable revolution in the state of the country, and we could have no more accurate or effective picture of the results of the revolution than Mrs. Milne's graphic and vivid description of the *Shans at Home*. Her knowledge has been acquired on the spot, for she spent fifteen months in 1907-8, in a small town near the frontier of Yunnan, and for some five months of the time she was quite alone among the Shans, the nearest Europeans being at Bhamo, some sixty miles away. Her chief object in the Shan country, she tells us, was to study the language of the Palaungs, an obscure tribe who descend from the hills to trade with the Shans, and students of philology will look forward with interest to the publication of her researches on this subject. In the meantime, we have in this volume a delightful and minute account of the daily life and customs of the Shans by whom she was surrounded. It is easy to see that she won their complete confidence and regard, and the very minuteness of her observations and the genuine enjoyment with which she records them prove that her Shan friends and neighbours were to her objects of no ordinary interest. According to Mrs. Milne, the Shans are a very attractive people. They are cleanly, simple, sober, moral, cheerful, industrious, contented and gentle in character. Buddhist in religion, their thoughts and conduct are greatly affected by their profound belief in the transmigration of souls, a beneficent doctrine, which inculcates constant kindness to all things living. In the Shan country, the aged, the insane, the infirm, the helpless, are objects of pity, and the children are early taught that kindness in this world is the best means to secure happiness after death. Shan kindness extends to the unknown wayfarer. "If there is no stream or well near a resting-place, there is generally a bamboo stand, covered by a tiny thatched roof shading two great water-pots. Women and girls bring fresh water to fill them day by day, having been taught that a 'cup of cold water' given to tired and thirsty wayfarers brings much reward in a future life." The Shans, in contrast to many Orientals, are very honest: Mrs Milne tells us that during the fifteen months she lived among them nothing was ever lost by her or stolen from her. They manage their love affairs much better than in India. Marriages are usually of affection and due to the free choice of the parties, and if parents are obdurate, elopements into the jungle, where a temporary hut has been prepared, are a simple and effective expedient, as the parents invariably forgive the disobedient lovers. Mrs. Milne has collected for us a number of quaint and amusing folklore tales, some of them obviously Shan variations of tales common in the East, and a number of Shan proverbs indicative of the simplicity and gentleness of the people. She has a good word to say for the beneficent influence of the Buddhist monks, and quotes some sentences of a discourse which might be preached with good effect elsewhere than in the Shan country. "Never kill the friendships of others by telling stories that might separate friends. Do not gossip about your neighbour's affairs, but if you must speak of them, use only sweet and pleasant words. Do not grumble at the weather, and remember that there is a specially uncomfortable hell for you if you do so. Do not accumulate money, unless you are going to use it for good acts," etc.

The Shans are now enjoying peace and prosperity, and their natural resources are varied and great: "their mountain ranges and alluvial valleys give almost unlimited choice of climate and variety of soil. Their highlands are full of mineral deposits; silver, copper, lead, antimony, iron, gold in the sands of rivers, tin and cinnabar have been found." What the country needs above everything else

is improved communications and especially railways. British manufacturers would do well to note what Mrs. Milne has to tell them about the many manufactured articles in daily use among the Shans, all labelled "made in Germany." Apparently the obstinate British manufacturer, here as elsewhere in the East, refuses to move out of his groove and produce the articles desired and approved of by the people ; the more sensible and pliant German makes and imports according to the local demand, with the result of securing a profitable business. To many of our readers the greatest attraction of the book will be the numerous photographs, which are exceptionally good ; they give us the impression of an amiable, gentle, and contented people. Mrs. Milne does not claim for her work that it is either exhaustive or scientific, but it unquestionably is a new and valuable contribution to the literature of anthropology, and secures for her a position in the ranks of Indian anthropologists, among such distinguished names as Risley, Grierson, and Crooke. We strongly recommend this work to the perusal of our readers.

Among Indian Rajahs and Ryots. By Sir Andrew H. L. Fraser, K.C.S.I. London : Seeley and Co., Limited, 1911. *Price* 18*s. net.*

Of late years we have had many books about India, and it is possible, as we all know, to make a book about India dry and uninteresting, bristling with statistics, a plethora of more or less undigested and ill-arranged facts to serve as a foundation for more or less dubious theories ; it is possible to treat India as a source of mere amusement, it may be, in the matter of sport or travel ; it can be shown to afford unlimited scope for the more serious labours of the archaeologist and antiquarian ; the rise, spread, and fall of its religions and civilisations have not as yet been completely investigated by the students of comparative religion or sociology ; much of its political and economic history still remains obscure. Sir Andrew Fraser, in the interesting and instructive volume now before us, has not hesitated to make an occasional excursion into the fields of history, ethnology, sociology, sport, and the like, but the essential value of this work lies in this, that it gives us from the pen of an exceptionally able and experienced officer a calm and impartial appreciation of certain aspects of the present position of affairs in two of the most important provinces of the empire. Sir Andrew is the first to disclaim the idea that he is sufficiently acquainted with all India to be competent to write about it as a whole ; and this, although he has had in the course of his long and arduous service exceptional opportunities of visiting and studying every province in the empire. Again and again he impresses on his readers the vastness of the empire, the multiplicity and complexity of its nationalities and creeds, the infinite variety of economic and political conditions, the enormous diversity of opposing interests, and the ever fresh and varying problems which have constituted, and still constitute, the difficulty of ruling India. But bearing in mind that Sir Andrew's experience lay mostly in the Central Provinces and Bengal, the reader can have no safer or wiser guide in a severe and critical study of some aspects of these important tracts. Sir Andrew is a staunch advocate and a brilliant exponent of the best traditions and practice of the Indian Civil Service. He lets us see how admirably he was trained as a young officer, and how successfully he put into practice the wisdom he had learned from the example and precepts of his teachers. His book is a wholesome reply to those who assert that there is now but little sympathy between the governing and the governed classes, for it is not too much to say that Sir Andrew owes much of his success to his sincere and warm sympathy with all classes of natives, which won for him their esteem and respect, and drew from them all their good points to the surface. He is never weary of

calling attention to the genuine loyalty, ability, and devotion of his native subordinates and friends.

In the course of his thirty-seven years in India Sir Andrew met with many exciting adventures and incidents, some of which (too few we think) he describes with justifiable enjoyment and zest, such as the grain riots in Nagpur and the Khond rebellion in Kalahandi. Most likely, however, the reader of to-day will think his chapters on the so-called Indian unrest the most interesting and important in the book. Probably Sir Andrew has had greater experience of the unrest than any officer in India ; and so his calm, impartial investigation of its origin and spread, its limitations, and the methods by which it should be controlled and cured, is well deserving of careful study. He in no way minimises or understates the danger of the unrest, but he gives excellent reasons for regarding it as merely local ebullitions, which will die down when treated with judicious firmness ; it is an error to think of them as general over the empire. In the same calm and impartial, but generous and sympathetic way, he discusses such thorny problems as these—education, missionaries, Indian women, and the like, but with regard to these and many other interesting matters we must refer our readers to the book itself. No one will lay it down after perusal without having his ideas enlarged and clarified regarding some of the many difficult problems which now demand attention in our Indian empire.

Seventeen years among the Sea Dyaks of Borneo. By Edwin H. Gomes, M.A. London : Seeley and Co., Limited, 1911. *Price* 16*s. net.*

Up to the middle of the nineteenth century the Sea Dyaks of Borneo held the same relation to commerce in the Chinese seas that the Algerian corsairs held to the commerce of the Mediterranean until the famous expedition of Lord Exmouth in 1814, which put an end to piracy from the African coast. The suppression of piracy in the Chinese seas was the work of the first white Rajah of Sarawak, Sir James Brooke, and is described at some length in the very interesting *History of Sarawak under its two White Rajahs*, reviewed in the *Scottish Geographical Magazine*, vol. xxvi. page 212. There we said " His vigorous and necessary measures to put down the piracy, which had paralysed commerce all along the Bornean coast and elsewhere, were described (in England) in such terms as these ; 'a human battue,' 'a massacre of harmless and timid people,' truly a quaint description of the Sea Dyaks whose one ambition was to hunt heads, and whose main, if not sole, occupation was piracy, slave-catching, and war."

In the very interesting volume now before us we have from the hands of a clergyman who has spent seventeen years among them, a picture of the transformation which has taken place in the life and manners of these once ferocious savages. Piracy, head-hunting, and slave-driving with all their kindred and inevitable concomitants are all gone for ever. The Sea Dyak is now usually a cultivator of paddy, some of them live by fishing, and some earn a precarious livelihood by gathering gutta-percha ; the women attend to the house and weave. In an introductory note, a former Archdeacon of Singapore describes them as " active, hard-working, industrious, ready to earn an honest penny when they have the chance, and in their domestic relations are amiable and hospitable towards strangers, and when treated with civility and sympathy, all their good points come to the surface " ; and this description is confirmed by the detailed narrative by Mr. Gomes. Every page in the volume indicates the secret of his success among these strange but simple people. He is full of sympathy and even affection for them, and thus he has won his way to their confidence and respect. Naturally secretive, they have held

nothing back from him ; even the witch-doctors took him into their confidence, and he has been able to elicit and put on record much valuable information as to their ancient habits, customs, superstitions and folklore, which in a very short time would inevitably have been lost. Thanks to the friendly relations which he established between himself and the people, he is able to set before us in simple but vivid and graphic language an accurate account of their present private life, their houses, dress, feasts, religion, birth, marriage and death ceremonies, sports, songs, system of agriculture, fishing and the like. Mr. Gomes sums up the Sea Dyak as "a warm-hearted, hospitable, cheery figure, satisfied with little, living in the present with no thought of the future, quite content if he have food to eat, and tobacco to smoke, and yet, for this very reason, because he is so satisfied with his lot, most unwilling to admit new ideas, seemingly for ever unconscious of the significance of his life, and ignorant of the infinite possibilities for good or evil which exist in him." This may be so, but when we compare him with what his ancestors of only two generations ago were, we may congratulate ourselves on the marvellous and beneficent change effected in so short a time by the enlightened and judicious administration of the two White Rajahs, ably seconded by missionaries like Mr. Gomes and others, and we look forward to the future with every confidence. We must add, this very interesting book has some excellent photographs, a useful map, and a good index.

AFRICA.

Biskra, Sidi-Okba and the Desert: A Practical Handbook for Travellers. By Joseph C. Hyam. First Edition. Algiers : Hyam and Co., 1910.

This is a useful little book, partly in French and partly in English, which gives full details in regard to Biskra and the adjacent regions, with particulars as to routes, fares, etc. It is copiously illustrated, and should prove very useful to intending travellers to Biskra and the desert.

The Khalifate of the West. By Donald Mackenzie. London : Simpkin, Marshall, Hamilton, Kent and Co., Ltd., 1911: *Price* 10*s.* 6*d.*

Mr. Mackenzie, the writer of this book, has had some thirty years' experience of Morocco, and considerable personal acquaintance with all classes of its inhabitants from the Sultan downwards. He has also been the friend and adviser of British ambassadors resident there during these years, and has evidently made it his business to see things for himself. He is on the whole friendly to the Moroccans, in whom he finds various traits to admire. But the picture which he has painted of the condition of the country is painful and lurid, and if it is to be trusted, Morocco must be one of the worst governed and unhappy among the many misgoverned and unhappy Mahommedan States in Africa. The Government is corrupt from head to foot ; the people are habitually and cruelly oppressed ; there is no semblance of justice in the land ; the numerous prisons are crowded with innocent citizens who welcome death as a happy relief from an intolerable life ; no one dares to be rich, as even a suspicion of having riches is a sure passport to confiscation and worse ; trade and commerce are practically stagnant ; slavery flourishes ; disaffection and rebellion are chronic ; hardly any attempt is made to improve communications ; education is neglected ; and, owing to the jealousies of the European Powers, there is no chance of adequate pressure being brought to bear on the Sultan to effect real reform. From first to last the book is painful reading. Its object apparently is to induce the public of Great Britain to urge on the Foreign Office of this country the duty of coming to terms with France, Spain,

and Germany, so that all four Powers may compel the Sultan to commence in earnest the formidable task of reform; a praiseworthy object indeed, and easily stated, but one for effecting which, we are fain to confess, we have failed to find in Mr. Mackenzie's book any practicable or feasible measures.

AMERICA.

A Saga of the "Sunbeam." By Horace G. Hutchinson. London, New York, Bombay, and Calcutta: Longmans, Green and Co., 1911. *Price* 6*s.* 6*d. net.*

Mr. Horace Hutchinson is well known to fame in the realms of athletics and sport, and as a contributor of many pleasant and instructive articles to one of the London daily newspapers. In this volume he tells us how last year he enjoyed himself as a guest on board Lord Brassey's famous yacht, the *Sunbeam*, during a delightful voyage from Dornoch to Iceland, thence to Newfoundland, and thence up the St. Lawrence River to Montreal, where his share in the cruise came to an end, as he had to return at once to England. By the time the *Sunbeam* had returned to Dover she had accomplished over 8000 miles, in the course of which for the first time in the history of the *Sunbeam*—a history which begins in 1874—an iceberg was seen from her deck. On the whole the voyage was uneventful. The charm of this book consists in the lucid and graphic style in which the commonplace incidents of the voyage are narrated. When on shore at St. John's in Newfoundland Mr. Hutchinson used his time and his eyes to good purpose, giving us an interesting account of the fisheries on which the prosperity of Newfoundland depends, and the settlement of Botwood, where the paper for the printing-presses of the Harmsworths is made. He had a round of golf on the historic "Plains of Abraham" at Quebec, and at Montreal he ascertained some useful facts as to the prospects of emigrants, viz., "the opportunities for clerks is *nil*; for farm labourers who go to the North-West there is quite certain employment, and the same is to be said of the chances of the skilled artisan, but no skilled artisan is permitted, if he has had an 'assisted passage,' to work at his craft until he has first put in twelve months' work as a farm labourer." Not the least interesting part of this book is the log of the *Sunbeam*, written by Lord Brassey.

GENERAL.

A Regional Geography for Intermediate Classes. By Frederick Mort. *Price* 1*s.* 9*d.* *Elementary Regional Geography.* By Frederick Mort. *Price* 1*s.* Edinburgh: Oliver and Boyd, 1910.

These two books are apparently identical, save that the smaller shows certain omissions. Both are characterised by their great wealth of maps and diagrams, including both coloured maps, orographical, political, and others, and also black-and-white sketch-maps. Both these sketch-maps and the many diagrams are clear and simple, and they and the coloured maps excellently supplement the text. It is, indeed, in this wealth of illustration that the special merit of the books consists. So far as we have checked the letterpress we have found it accurate and well-arranged, and the constant reference to the map is a good feature. Altogether we recommend the books to the notice of teachers.

La Vie politique Orientale en 1909. Par G. Samné and Y. M. Goblet. Paris: "Correspondance d'Orient," 1910. *Price* 6 *frs.*

Various subjects are treated of in this work, such as, the Balkan Crisis and the affairs of Crete, Constitutional Turkey, the Balkan Slavs, the Military Dictator-

ship in Greece, the Persian revolution, Egyptian questions, and Morocco. The authors are generally impartial, but sometimes they descend into the arena, as when they blame the British administrators of Egypt for not assisting the Egyptians financially in 1909. "The Government was severely criticised because neither it nor the Banks assisted the people of Egypt. It was matter of comment that, although not a piastre was given to Egyptian taxpayers, millions were found for the Sudan. Some native papers even insinuated that the object of the British was to govern Egypt, like India, by means of pauperism. Did not an English historian once confess that England ruined Ireland to prevent it becoming troublesome? These are regrettable exaggerations. But we must admit that the British administration seems bent on provoking them by a policy of which the leading principle is easy to discover, viz., a calm egoism which holds that Egypt is governed not for itself but for the strangers who occupy it. As long as that is so, the Egyptian problem cannot be satisfactorily solved." While the "strangers" referred to belong to all the nations of Europe, including the authors' own French compatriots, the natives of Egypt now enjoy, what they never did before, peace and liberty.

Beasts and Birds: A Nature Book for Boys and Girls. By C. Von Wyss. London: Adam and Charles Black, 1910. *Price* 1*s.* 6*d.*

This is another of Messrs. Black's colour books, and would form a very attractive gift for a child. The text is clear and simple, and gives interesting accounts of the common animals, both at home and abroad.

The British Empire in Pictures: A Geographical Reading Book. By H. Clive Barnard, M.A. London: Adam and Charles Black, 1910. *Price* 1*s.* 6*d.*

This is an attractively illustrated and well got up book, no less than thirty-two of its fifty-eight illustrations being in colour. The text is good on the whole, but might, we think, have had a little more attention given to detail. The camel certainly does not "store water in its hump" (p. 52). A sentence on p. 18 which speaks of maize, sugar-cane and "other tropical products" is we think likely to mislead. Maize of course grows abundantly in many parts of the continent of Europe, even so near at hand as France and north Italy, yet the idea that it is a tropical plant is hard to eradicate from the mind of the ordinary inhabitant of the British Islands. Considering further that Lombardy owes much of its prosperity to its rice-fields, we think that the statement on p. 24 that the plant requires "great heat" and is grown in tropical countries should be qualified. These may seem trifles, but they mean the implantation of erroneous ideas which are very difficult to eradicate later.

General and Regional Geography for Students. By J. F. Unstead, M.A., and E. G. R. Taylor, B.Sc. London: George Philip and Son, Ltd., 1910. *Price* 6*s.*

This book is divided into two parts, the first taking the world as a whole, and treating of those general principles of land formation, climate, industries, and distribution of life, which are best considered by older students on a large scale. The second part is devoted to a study of the world in regions, these being based upon Mr. Herbertson's sound system of classification by climates. The maps and diagrams are numerous and well chosen, the latter especially being commendable for containing just the right amount of detail for the subject in hand. Special praise is due to the chapters on the "Earth as a Planet," and "Precipitation."

In pleasing contrast to most other text-books the treatment of the mountain regions, and particularly of the Alps, is sound. Another good feature is the list of authorities and books for further reading at the end of each chapter. There is a useful index.

The Great Pyramid Passages and Chambers. By JOHN EDGAR, M.A., B.Sc., etc., and MORTON EDGAR. Vol. I. London: Elliot Stock, 1910. *Price* 7*s.* 6*d. net.*

The full title of this book is as follows: "The Great Pyramid Passages and Chambers, in which is shown how the Great Pyramid of Gizeh symbolically and by measurement corroborates the philosophy and prophetic times and seasons of the divine Plan of the Ages, as contained in the Holy Scriptures, together with twenty letters from Egypt and Palestine." We quote it entire as it sufficiently indicates the scope and aim of the book, which is fully illustrated. The present volume is to be followed by another which "will enter into the Great Pyramid's corroboration of the time features of the Plan of the Ages."

The Danger Zone of Europe: Changes and Problems in the Near East. By H. CHARLES WOODS. London: T. Fisher Unwin, 1911. *Price* 10*s.* 6*d. net.*

The result of observations made during two extended tours in the Near East since 1908, this book discusses the new Constitutional Government of Turkey, the Turkish Army and Navy, the Albanian Question, the Armenian Massacres of April 1909, and Asia Minor, Crete, Greece, Bulgaria, Servia, Montenegro, and Bosnia in 1910. It thus covers a wide field, and, illustrated by many photographic reproductions, and three maps, enables the reader to obtain much light on countries which have disquieted Europe very much in recent years. In spite of many attempts to solve the mystery, the author admits that he has "never been able to ascertain more than the most hazy outline of how the Committee of Union and Progress not only effected the Revolution but subsequently how it established itself as the most powerful influence existing in" Turkey. The central organisation of this mysterious body "appears not only to maintain its influence and to issue its orders through the medium of clubs," established in every district, "but also to send inspectors to different parts of the Empire to see that these orders are promptly carried out." The headquarters of the Committee being at Salonika, that City and not Constantinople is now, in one sense, the political capital of the Ottoman Empire. The author found that "the fact of the Parliamentary elections not being fairly, or at least more or less fairly, carried out, is certainly responsible for a large amount of the discontent which exists, especially among the non-Turkish elements of the population of the Ottoman empire." He also remarks that "the fanaticism of the Mohammedan population of the Empire is probably one of the greatest obstacles which has to be encountered by the Young Turks." A Young Turk once explained to him "that, in his opinion, Religion was essential to nations in the past, but that it could not be allowed to affect the destiny of the world and its inhabitants to-day."

The author exposes the financial difficulties of Turkey, and its urgent need of roads and railways, irrigation, telephones, electric light, and waterworks. He contrasts the excellent roads, extensive railway construction, and good agriculture in Bulgaria with the contrary in Turkey. The Bulgarians resident in Macedonia are, owing to the strong foreign support they might obtain, those Christians of whom the Young Turks are most afraid. A photograph of the great Bulgarian brigand Sandansky is here reproduced. Sandansky's political formula is "Macedonia for

the Macedonians." As for the Greeks there, the author found them "being subjected to various petty injustices and annoyances." The author considers that "the establishment of good government alone can ensure the development of a strong Turkey, and prevent the Macedonian question from again becoming as acute as it was during the closing years of the reign of Abdul Hamid." The Army (now drastically reformed) "is still the controlling factor which regulates both the internal and foreign policy of the Turkish government." Both officers and men, however, are greatly wanting in education, and "the discipline of the Turkish army is certainly not above reproach."

In Albania, the Young Turks have not yet conciliated the people, but have angered them by taxation, disarmament, and by insisting on writing and reading in the National Schools being carried out with the Arabic, instead of the national Latin, characters. It is, however, "by the support or the opposition of the population of the Asiatic provinces of the Empire that the destiny of the Reformers of Turkey will be decided." After visiting Asia Minor, the author considered that more reforms have been effected by the Young Turks there than elsewhere. "That these reforms are more apparent in Asia Minor than in European Turkey is at least in part due to the fact that the state of Asia Minor under the old régime was even worse than that of European Turkey." The author visited Bulgurlu, the present terminus of the Baghdad railway. We notice that he writes "Bagdad," whereas the correct form is "Baghdad," which, according to Layard, signifies "the Garden of Dad," from an idol formerly worshipped there.

The Earth and its Story. By Arthur R. Dwerryhouse, D.Sc., F.G.S. London: Charles H. Kelly, 1910. *Price* 5*s. net.*

In his preface the author remarks—"How few people possess even the most elementary knowledge of the natural processes at work on land and sea, destroying continents and islands, building up new ones and even altering the face of our planet"; and in this volume he conveys that elementary knowledge in a very attractive form.

The axiom on which his teaching proceeds is that the present is the key to the past, and he treats, first, of the "Historians" of the Earth, and their language, and, second, of the "History" they relate. The historians are, it need hardly be said—the rocks,—the wind and the rain,—hail and cold,—rivers and tides,—earthquakes,—fossils: and the history is that of the earth as we know it. As he remarks in a closing paragraph: "Every new railway cutting, mine shaft, landslip, quarry, or well, brings to light something on which the eye of man has never yet rested, and who shall say that any one of these excavations, mere scratch on the earth surface though it be, may not furnish the clue to one of the hidden mysteries of the story of the earth."

The book is very readable and has numerous good photographic illustrations.

As a sample of the varied information to be found throughout the volume and the clear exposition, the following may be given:

Frost. "Let us now enquire what happens in a lake on a frosty evening. We will suppose that the water is fairly cold, say about 10° Centigrade. The water at the surface will be cooled by contact with the cold air above it, let us say to 4° Centigrade. During this change it will contract and will thus become heavier and will sink to the bottom of the pond, and some of the water from below will be pushed up to the surface to be cooled in its turn, and this will go on until all the water is reduced to a temperature of 4°. As the night comes on the air gets colder and the water gives up still more heat, but now the surface water, on being cooled

from 4° to 3° will expand, and will thus become lighter, and will not sink to the bottom, but will float at the top and get colder until it reaches the freezing-point (0° Cent.) when it will change into ice, and since in the act of freezing it expands and becomes still lighter, the ice crystals will float and will eventually form a sheet of ice all over the lake, on which we can slide and skate in the morning."

Dr. Dwerryhouse gives the following reasons for concluding that the interior of the earth is solid. "The earth is nearly twice as heavy as it would be if it were made of rock right down to the centre. For several reasons it seems probable that the interior of the earth consists largely of metals amongst which iron probably plays a considerable part." "For many reasons it is now believed that the earth as a whole is solid and that the volcanoes are supplied from reservoirs of molten rock of limited extent." "Certain earthquake waves . . . though inaudible are carried through the interior of the earth with a greater speed than that at which they would pass through tempered steel, and we are therefore driven to the conclusion that the interior of the earth must be more elastic than steel. This property is one which it seems difficult to reconcile with a fluid condition, and it is therefore concluded that the earth is for the most part solid."

BOOKS RECEIVED.

An Outpost in Papua. By the Rev. Arthur Kent Chignell. With a Preface by the Archbishop of Brisbane. Illustrated. Demy 8vo. Pp. xii + 375. *Price* 10*s.* 6*d. net.* London: Smith, Elder and Co., 1911.

How People Live. (*The New Outlook Geography.*) Part I., The British Isles. Part II., Outside the British Isles. By W. C. Brown, M.A., F.C.P., and P. H. Johnson, B.A., L.C.P. Scottish Edition. Revised and Adapted to the use of Scottish Schools. By H. J. Findlay, M.A. Cr. 8vo. Pp. 252. *Price* 1*s.* 6*d.* London: George G. Harrap and Co., 1910.

Palestine and its Transformation. By Ellsworth Huntington. With Illustrations. Demy 8vo. Pp. xvii + 442. *Price* 8*s.* 6*d. net.* London: Constable and Co., Ltd., 1911.

The Voyage of the "Why Not?" in the Antarctic: The Journal of the Second French South Polar Expedition, 1908-1910. By Dr. Jean Charcot. English Version by Philip Walsh. With Numerous Illustrations from Photographs. Cr. 4to. Pp. viii + 315. *Price* 20*s. net.* London: Hodder and Stoughton, 1911.

Schottland und seine Bewohner. Von Dr. Walter Suck. Cr. 8vo. Pp. 59. Oschersleben: Gebr. Köppel, 1911.

Hints to Meteorological Observers. By W. Marriott, F.R.Met.Soc. Seventh Edition, 1911. Demy 8vo. Pp. 75. *Price* 1*s.* 6*d.* London: Edward Stanford, 1911.

Europe and the Mediterranean Region (*Elementary Regional Geography*). By J. B. Reynolds, B.A. Small cr. 8vo. Pp. viii + 184. *Price* 1*s.* 4*d.* London: Adam and Charles Black, 1911.

Burmese Self-Taught. (*In Burmese and Roman Characters.*) With Phonetic Pronunciation. By R. F. St. A. St. John, Hon. M.A. (Oxon). Cr. 8vo. Pp. 168. *Price* 6*s.* London: E. Marlborough and Co., 1911.

A Fisherman's Summer in Canada. By F. G. Aflalo. Illustrated from Photographs. Cr. 8vo. Pp. xii + 147. *Price* 5*s. net.* London: Witherby and Co., 1911.

Shans at Home. By Mrs. Leslie Milne. With two Chapters on Shan History and Literature by the Rev. Wilbur Willis Cochrane. With Illustrations. Demy 8vo. Pp. xxiv + 289. *Price* 15*s. net.* London: John Murray, 1910. (Presented by A. L. Cross, Esq.)

The Veddas. By C. G. Seligmann, M.D., and Brenda Z. Seligmann. With a Chapter by C. S. Myers, M.D., D.Sc. And an Appendix by A. Mendis Gunasekara. Demy 8vo. Pp. xix + 463. *Price* 15*s. net.* Cambridge: University Press, 1911.

An Historical Relation of Ceylon: Together with somewhat concerning Severall Remarkeable passages of my life that hath hapned since my Deliverance out of my captivity. By Robert Knox. Demy 8vo. Pp. lxvii + 460. *Price* 12*s.* 6*d. net.* Glasgow: James MacLehose and Sons, 1911.

How to use Contour Handmaps for Class Teaching. By J. A. White. Demy 8vo. Pp. 8. *Price* 6*d.* London: George Philip and Son, Ltd., 1911.

Beginnings: or Glimpses of Vanished Civilisations. By Marion M'Murrough Mulhall. Cr. 8vo. Pp. viii + 119. *Price* 2*s.* 6*d. net.* London: Longmans, Green and Co., 1911.

A Geography of Ireland. (*The Oxford Geographies.*) By O. J. R. Howarth, M.A. Cr. 8vo. Pp. 224. *Price* 2*s.* 6*d.* Oxford: Clarendon Press, 1911.

The British Isles. (Geography Notes.) Pt. I. Pp. 32. *America* (*Non-British*). (Geography Notes.) Pt. IV. Pp. 26. By J. C. Chute, M.A. Cr. 8vo. *Price* 1*s.* 6*d. each.* London: J. M. Dent, Ltd., 1911.

The Geology and Geography of Northern Nigeria. By J. D. Falconer, M.A., D.Sc., etc. With Five Maps and Twenty-four Plates. Demy 8vo. Pp. xiv + 295. *Price* 10*s. net.* London: Macmillan and Co., Ltd., 1911.

An Englishwoman's Twenty-five Years in Tropical Africa. Being the Biography of Gwen Elen Lewis, Missionary to the Cameroons and the Congo. By George Hawker. With Illustrations and Map. Demy 8vo. Pp. xiv + 352. *Price* 6*s.* London: Hodder and Stoughton, 1911.

A Nook in Galloway. By Thomas Newbigging. Cr. 8vo. Pp. 100. *Price* 2*s. net.* Gatehouse-of-Fleet: J. R. and A. Kirkpatrick, 1911.

L' Indo-chine Française. Par H. Russier et H. Brenier. Avec 56 Gravures dans le Texte et 4 Cartes hors texte en couleur. Cr. 8vo. Pp. 356. *Prix* 4 *francs.* Paris: Libraire Armand Colin, 1911.

The Dolomites (*Grieben's Guide Books*): *a Practical Guide.* With Three Maps. Small 8vo. Pp. 149. *Price* 3*s. net.* Berlin: Albert Goldschmidt, 1911. London: Williams and Norgate, 1911.

Among the Tribes in South-West China. By Samuel R. Clarke. Cr. 8vo. Pp. xv + 315. *Price* 3*s.* 6*d.* London: China Inland Mission, 1911.

Argentine Plains and Andine Glaciers. Life on an Estancia, and an Expedition into the Andes. By Walter Larden, M.A. With a Map and Ninety-one Illustrations. Demy 8vo. Pp. 320. *Price* 14*s. net.* London: T. Fisher Unwin, 1911.

La Haute-Loire et le Haut-Vivarais: Guide du Touriste, du Naturaliste et de l'Archéologue. Par Marcellin Boule. 109 Illustrations dans le Texte. 1 carte en couleurs. Small Cr. 8vo. Pp. viii + 363. *Prix* 4 *francs* 50. Paris: Masson et Cie, 1911.

Letters from Finland, August 1908-*March* 1909. By Rosalind Travers. With 34 Illustrations and a Map. Demy 8vo. Pp. xi + 404. *Price* 7*s.* 6*d. net.* London: Kegan Paul, Trench, Trübner and Co., Ltd., 1911.

By Fell and Dale at the English Lakes. By the Rev. H. D. Rawnsley. With

Eight Illustrations. Cr. 8vo. Pp. x + 233. *Price 5s. net.* Glasgow: James MacLehose and Sons, 1911.

Through the Alps to the Apennines. By P. G. Konody. With Ninety-three Illustrations and a Frontispiece in Colour. Cr. 4to. Pp. xii + 370. *Price 12s. 6d. net.* London: Kegan Paul, Trench, Trübner and Co., Ltd., 1911.

District Gazetteers of the United Provinces of Agra and Oudh: Aligarh (vol. vi.); *Shahjahanpur* (vol. xvii.); *Gorakhpur* (vol. xxxi.). By H. R. Nevill, I.C.S., F.R.G.S., F.S.S., M.R.A.S. *Jhansi* (vol. xxiv.). By D. L. Drake-Brockman, I.C.S. Allahabad, 1909-10.

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THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

AN EXPEDITION TO THE SNOW MOUNTAINS OF NEW GUINEA.[1]

By H. A. Lorentz, LL.D.

(*With Map and Illustrations.*)

Immediately after my second expedition to New Guinea in 1907, I had the intention to undertake another expedition with the principal object of reaching the Wilhelmina peak of the "Snow Mountains." I am of opinion, and experience proved that I was right, that an enterprise of this kind can only succeed if every detail has been carefully considered, discussed, and arranged; nothing should be left to chance, for the lives of too many men are at stake. The experience gained during the expedition of 1907 would have been of invaluable service to us, even if we had only learned to know what kind of carriers we wanted. I avoid the word "coolies" on purpose, because in my opinion this word indicates a somewhat inferior class of persons, whereas the Dyaks stand very high in my estimation.

Before going further, I shall first give some information about the country, the people, and the formation and equipment of the expedition.

As every one knows, New Guinea is almost the largest island of the globe, measuring 306,000 square miles—that is to say, it is twenty-four times as large as Holland. The western half is a Dutch possession with the 141st meridian east and the Fly River as an imaginary boundary; the north-eastern part is a German possession, whereas the south-eastern part is British. The greatest length is 1500 miles; the extreme width is 380 miles.

[1] A lecture delivered to the Society in Edinburgh on Feb. 9, 1911. We are indebted to the courtesy of the Royal Geographical Society for the map and illustrations which accompany this article.—Ed. *S.G.M.*

Until recently the greatest ignorance prevailed concerning this island. It is true many expeditions had been undertaken, owing to Sir W. Macgregor's unfailing energy, but our knowledge of the Dutch possession was chiefly confined to the coastline and the highlands behind it. We owe our knowledge of the inhabitants to the missionaries, and I feel bound to mention with gratitude the name of the Nestor of the missionaries, Mr. van Hasselt, who for more than forty years resided at Mansinam on Geelvink Bay, to whom our thanks are due for his publication of a dictionary of the "Noemfoor" language, which, in contrast with the other languages, if not spoken, is at least understood in a large part of New Guinea. Among the younger missionaries I greatly appreciate Mr. Kappers and Mr. Nollen, missionaries of the Holy Heart, whose acquaintance I had the pleasure of making during my stay at Merauke in 1907. They published a series of articles on the people and the language, that gives ample proof of serious and careful study, for too often, alas! opinions not founded on thorough investigation are placed before the public. I allude chiefly to the reports about cannibalism. Certain writers think it highly interesting to declare that they visited the so-called man-eaters. Until more convincing proofs are forthcoming, I cannot believe that the Papuans whom we visited are real cannibals—that is to say, that they feed on human flesh, the conditions in which they live being too favourable. That there exist ceremonies, at which the heart and the brains are consumed in order to secure the courage and the intellect of the slain enemy, I can readily believe, but I do not consider this cannibalism. I myself received a reply from a Papuan, from which it might be concluded that they are man-eaters; but before arriving at a thorough knowledge of their language and customs, I would not go so far as to declare that the Papuans of the North River, where I received this information, are cannibals.

Dutch New Guinea is divided into three "assistant residences," with Manokwari on Geelvink Bay in the north as the seat of the Government official, forming part of Ternate; in the west, Fak Fak, belonging to Ambon; and in the south the independent assistant residency of New Guinea stationed at Merauke. This province has an independent assistant resident in order to settle more quickly disputes which might arise with the British possessions, in consequence of the raids which Papuans of our part make into British territory. Thanks to the energetic measures taken by our Government, these have been completely checked.

It is really incomprehensible that so interesting a land has been left unexplored for so long. Wallace was the first to point out in his excellent work all the beauties and mysteries of this country. It seems incredible that not till 1909, that is 286 years after Jan Carstensz mentions in his journal that on February 16 he saw mountains covered with snow, we were enabled to reach this untrodden snow! It is really wonderful that this country, with such hidden treasures, has not been the object of scientific research before. Can there be a more interesting country for the zoologist and the botanist, for we find transitions from a tropical landscape in the plains to eternal snow, and for the geologist, who comes into an almost unexplored country? What fossils

may be found where living animals already show such interesting forms! How wonderful a variety of beautiful birds Nature has bestowed upon New Guinea, the land of the birds of paradise! To conclude, is it possible that nowadays, when the most astonishing inventions follow one another in rapid succession, that in one part of the globe there is to be found a people living in the Stone Age, and in habits equal to the lake-dwellers?

In 1903 this state of ignorance was brought to an end by a series of expeditions, which were opened by the expedition under the experienced geologist and historian Professor Dr. C. E. A. Wichmann, who made Humboldt Bay, on the north coast, the scene of his labours. Next comes the so-called South-West New Guinea expedition, in 1904-1905, led by Captains Posthumus Meyes and De Rochemont, to which we owe the discovery of East Bay and the North River, the entrance for the expeditions of 1907-1909, which I had the pleasure of leading.

The Dutch East Indian Government at this time took an interest in the matter, and organised different so-called exploration detachments in order to obtain as soon as possible a general map of the island, a very laudable attempt which we owe to the energy of Governor-General J. B. van Heutsz. A detachment operated at Merauke and its surroundings; explored the Digoel River and tried to cross New Guinea, with the Island River as their base, and to reach the Carstensz Peak by way of the Oetakwa River. Another party tried to reach the Snow Mountains from the north coast by ascending the Ambernoh River. The commander of this party was Captain Franssen Herderschee, well known to those interested in the exploration of Surinam. Though he penetrated far into the interior near the foot of the mountain range and nearly succeeded, he was, alas! obliged to return, owing to beri-beri and malaria, which attacked his coolies.

I must now mention the international expeditions. On the south coast the English are endeavouring to reach Carstensz Peak along the Mimika River. Finally, a Dutch-German frontier committee is at work in the north, a little to the east of Humboldt Bay, in order to find a more rational boundary than the 141st meridian east. This is the present state of affairs.

It is gratifying that this island, which justly claims our attention rouses at present so much interest.

The members of the South New Guinea expedition of 1909 consisted of myself as leader and zoologist; J. W. van Nouhuys, commander in the Dutch navy (geology, cartography, and meteorology); L. S. A. M. v. Römer, surgeon in the Royal Dutch navy (botany, medicine, and anthropology); Raden Jaarman Soemintrol Zeerban, native physician; 82 Dyaks, carriers, of whom 66 were Kajans from the neighbourhood of Poetoes Sibau on the Mendalem River, 16 Kĕnjăs from the environs of Boelongan, 5 Malays, 10 Soendanese, and 2 botanists from the Botanical Gardens. Under the command of Lieut. D. Habbema, known from the Bem Brem expedition in Borneo, were 4 European sergeants, 2 native sergeants, 2 native corporals, 34 native fusiliers, 1 hospital soldier, and 20 convicts, 11 of whom were Dyaks. Half this detachment was sent to

Merauke as a reserve party. The Dyaks formed the majority even among the convicts, as carriers of the victuals and the baggage of the soldiers. This choice proved to be a right one; indeed, no expedition to New Guinea can be undertaken nowadays without the support of Dyaks.[1] Owing to the fact that these people, when in Borneo, lead the same kind of life as in New Guinea, they are wont to roam about in the forests in search of food, and are very fond of making long journeys of which they boast. They are expert builders of boats, and in the cataracts they are unequalled as rowers, and easily carry loads in their dorsers, so excellently adapted for the purpose. The 66 Kajans I recruited myself at Poetoes Sibau, the field where Professor Nieuwenhuis worked, and it was owing to his influence and to the confidence he inspired, that I succeeded in recruiting so many. They were commanded by three chiefs, Tigang, Adjang, and Ngaw Aboei; the two first mentioned especially took an important part in the expedition, and it is to their energy that we owe our success. We enlisted the services of sixteen Kĕnjăs obtained through the personal influence of Lieut. Habbema; the Kajans came from the western district, the Kĕnjăs from the eastern district, in the neighbourhood of Boelongan. The five Malays came from Poetoes Sibau, and, properly speaking, were half Dyaks. They are natives of Borneo, and occupy themselves with collecting rattan and rubber, and are accustomed to lead a rough life. We also took Soendanese with us, not to be entirely dependent on a single race, a thing which in case of conspiracy might have serious consequences. Too much enervated by camping life, they suffered from maladies, and gave very little satisfaction. None of them had been above an altitude of 8000 feet; but they proved themselves useful to the surgeon in assisting in botanical matters. The soldiers had been picked from young and strong men, not to be an impediment to the rapid progress of the expedition.

A few words about our equipment may prove of interest. Our chief article of food was rice, 0·8 kilogram per man per day, with dried meat and salt fish and something for dessert. To give an idea of our stores, we had 12,000 kilograms of rice, 2500 kilograms of fish, 1000 kilograms of meat, and in addition 4500 kilograms of Katjang idjoe, a kind of pea, taken as a prophylactic against beri-beri, boiled with Java sugar, of which we took a supply of 2000 kilograms. In order to keep our food supplies dry they were packed in soldered paraffin tins; these tins, when filled, weigh about 20 kilograms, which is the load for one man; the carrier's own baggage must be taken into consideration, therefore heavier loads are not advisable.

The carriers who formed the expedition to the Snow Mountains received a jersey and a pair of baize trousers, and a bag of impermeable material for their garments during the marches, thus enabling them to put on dry clothes every evening; they also received a woollen blanket. Shoes were not provided, because previous experience had taught us that

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[1] See *Country Life*, Saturday, December 17, 1910, vol. 28 (No. 728), p. 887. "The Expedition of the British Ornithologists' Union to the Snow Mountains of New Guinea." VII. "From the Waitakwa to the Twaka River."

they did not put them on; they march with more security without them. In the highlands, especially in extreme cold, this was a great disadvantage, their feet becoming numbed and insensible, so that they were not aware of the wounds they received in the daytime.

To serve as roofs we took covers of green rot-proof canvas, measuring 5 by 5 metres, forming the load of one man. Our beds consisted of bags of waterproof canvas, in which our clothes were carried during the day. Mattresses were not to be thought of; but lacking these articles of luxury, one soon gets accustomed to do without them.

As on the former expedition, we could, thanks to the benevolence of the Marine Department, dispose of a bivouac ship, in which our victuals, as well as the collections, were stored; it served also for the members of the expedition who might fall ill. For this purpose the native surgeon had been included in the party, and the vessel, the *Eagle*, had been appointed as his temporary place of abode. I may add that the native surgeon ascended the Hellwig Mountains with us, 8200 feet, therefore it will be understood that the state of health was excellent. As a prophylactic against malaria, every member of the expedition, no one excepted, received every eighth or ninth day a gram of quinine.

I shall now pass on to the expedition proper.

After a long period of careful preparation the expedition started on August 5, 1909, from Soerabaja, in the bivouac ship the *Eagle*, towed by the Government's steamer *Falcon* under the command of J. H. Hondius van Herwerden, whose name is closely connected with the exploration of New Guinea; he was the first to sail up the North River to locate Wilhelmina peak accurately. The supporting detachment under Lieutenant Habbema, together with the sixteen Kenjas, took up their quarters on board the *Falcon*. The voyage was uneventful; but we were very much inconvenienced by the rough sea. On the route we touched at Timor Koepang and Dobo to coal. It was a great relief to the Dyaks to disembark for a while.

On September 1, after a fortnight's voyage, we anchored in East Bay in order to pass the bar at high water. The name "bay" is somewhat inappropriate; in this bay three large rivers empty themselves—the Oetoemboewe, the North, and the North-West River. In contrast with the preceding expedition, when on our arrival it was raining and kept raining until the end of the expedition, the weather was now fair, though clouds made the mountains invisible. We continued our voyage as far as the second large right-hand affluent, the so-called Van der Sande River, named after Dr. G. A. J. van der Sande, surgeon in the Royal Dutch Navy, who as physician accompanied the expedition under Professor Wichmann, and who distinguished himself by his excellent work on ethnography and anthropology. By his premature death science has suffered a great loss. This Van der Sande River, according to the reports of the exploration detachment, is said to be a good entrance to the highlands, better than the North River. We therefore resolved to make a short excursion with the steam-launch and one canoe I bought in Borneo. The only result was that we found this river of less value than the North River for penetrating as far as the central mountains. The

North-West River.

North River is navigable with a steam-launch, and for canoes. Rapids in the Van der Sande River were an impediment to our further penetration into the interior. Such an excursion, however, is of value, because the collections are added to; furthermore, we got some insight of what the Dyaks were capable of in the rapids. With marvellous skill they push their boats up-stream, always picking the best and the easiest way amidst the boulders.

On this excursion we saw little of the Papuans; here and there was a small shed, or, fastened to the riverside, a few canoes, in which we deposited a knife or some beads as a token of our friendly feelings. Departing September 6, we returned on September 12. The Dyaks, who did not take part in this little excursion, were not idle in the meantime; they had built ten fine canoes, and two more were nearly ready. The region in which they had been obliged to work was most unfavourable, being for the greater part swampy; continuous rain also proved a great drawback. Tigang naturally took a pride in the amount of work they had performed; to us it was a source of great encouragement, because it proved the capability of the men we had taken with us. There were many Papuans in the neighbourhood, and at stated times they came to our vessel, bringing with them ethnographical objects, hogs, fish, and fruit in exchange for knives and hatchets; hatchets especially were in great demand. I believe they were laying out a new garden. They made friends with the Dyaks, and regarded with great interest the building of the canoes.

The *Eagle* was towed as soon as possible down to Bivouac Island and anchored on the same spot as the *Swallow* of the former expedition in 1907. In Bivouac Island barracks for the soldiers were built, and on the other side a vegetable garden was laid out. In the meantime transports were sent to Alkmaar, our former quarters, at the foot of the mountains, and the place from which our expedition started for the Wilhelmina peak.

During the expedition of 1907 we had been very much troubled by cases of malaria and beri-beri, which we attributed to our long stay in the low, wet, and marshy regions.

This time we took the precaution of constructing enough canoes to transport our stores as quickly as possible. The voyage to Alkmaar was made in this manner. The goods were towed down to Rain Island in a steam-launch and long boats; it was not advisable to send the launch farther. Here camp was pitched, consisting of a large storehouse for the goods and housing accommodation for the men. From this point everything was in two days transported up-stream to a small intermediate station that was only used during the aforesaid transports.

In Rain Island a temporary post had been stationed. To show the rapidity with which everything was executed this time, the following table may be of interest:—

1907.—May 10, anchored off Bivouac Island, assembled at Alkmaar July 28 (79 days).

1909.—September 13, anchored off Bivouac Island, assembled at Alkmaar October 4 (22 days).

This makes a difference of nearly two months. It should be borne in mind, however, that we had gained in experience, and that our men were highly superior to those we had formerly; we were also in possession of many more canoes. As for the collections, slow progress is much more favourable.

On October 4 we were all assembled at Alkmaar, except Raden Jaarman, who remained on board the *Eagle* to be at hand should any one fall ill, while a small garrison was stationed in Bivouac Island to keep watch over the *Eagle*. Afterwards we learnt that the Papuans in their canoes came with their families at fixed times to visit the *Eagle*. We remained on friendly terms with them, and visited them in their settlement.

At Alkmaar provisions had been stored for a hundred days; we were of opinion that within this time we should have attained our purpose. Alkmaar is situated on the North River at the foot of the mountains; ascending the river above this place is not advisable. The Dyaks had built a solid house, with a storehouse behind for provisions. The roof was made of "siraps," a kind of small boards, covering one another like tiles and fastened together by means of wooden pegs. Tables, chairs, hat-stands, everything had been made by their dexterous hands. A Dyak is, properly speaking, never idle. When at home he is occupied in plaiting and wood-carving, but he greatly prefers roving in the forests, hunting, fishing, and searching for all kinds of edible plants.

We decided to start on October 8. Van Nouhuys and I went in advance with some of the carriers to cut a way to the summit of the Hellwig Mountains, which we had ascended in 1907. From our previous camp Wilhelmina peak had been hidden from our sight by the Treub and Wichmann mountain chains. This time we decided on a spot more to the west. Previously our time had been occupied in fixing and distributing the loads and warm clothing. The distribution of the thick garments was quite an event: to receive clothes without payment was a thing unheard of among the Dyaks. When all was arranged, we were invited to be present at a great ceremony; one of the Dyaks officiated as priest and delivered long speeches in his mother tongue, which we did not understand, strewing rice in every direction and invoking the good spirits to implore their protection.

Violent rains caused us to delay our departure until October 9. Besides Van Nouhuys and myself, our party consisted of 25 Dyaks, 1 Soendanese, 3 soldiers, and 5 Dyak convicts. We took provisions for about a fortnight; the transport of instruments and things we wanted for camp-life, collections and necessary articles for personal use, required many carriers. It is a most inhospitable country, where not a square metre of smooth ground is to be found, where copious rains make everything wet and slippery, and thickly covered with mosses.

We agreed that Lieut. Habbema was to follow us with some of the carriers to convey an addition to our stores, and we were then to make the Hellwig Mountains the starting-point of our great expedi-

View from Alkmaar Camp. To the left, in the distance, the Hellwig Mountains. To right, Mount Resi.

tion. It must not be imagined that, in a primeval forest where there is no beaten path, and one is obliged to cut one's way and to proceed guided by compass only, much progress is made in a day. One may feel quite satisfied if only three miles per day are covered, but there are days on which one does not proceed half this distance. The first day we had a picturesque camp in the vicinity of a beautiful, limpid, mountain stream at an altitude of about 390 feet. The following day began with a difficult job; we had to cross a rather wide river with a strong current, but thanks to a long rattan, which served as a rail, we performed this without any accident.

Little by little the route rose; from time to time steep hills had to be climbed, and as the carriers were not yet accustomed to marching in hilly regions, we were often obliged to call a halt. In the afternoon a tremendous shower of rain caused us to look for a camping ground, which we thought we should find at the confluence of two brooklets, which became small rivers. The water rose so suddenly that a soldier, who had mounted guard near a steep declivity, was forced to run for his life to avoid being swept away. Probably a dam, which had kept back the water, had given way. In the evening the Dyaks felt rather miserable; owing to the rain the house had been badly constructed, and the canvas had not been properly stretched, which caused many leakages. - Supper was late and, owing to the damp wood, underdone. Small wonder that they were in low spirits and were less enthusiastic about the Snow Mountains. Happily by nine o'clock the following morning the weather cleared and the march was cheerfully continued. In the afternoon the Dyaks built a splendid house on the top of a hill, commanding a fine view of the Hellwig Mountains; the surroundings were cleared of trees. Notwithstanding the fine house we continued our way the following day, gradually climbing, and crossing a mountain stream here and there; but a really difficult region we had yet to encounter. It is true, that we found here and there a steep slope, or a thickly covered part, but these were seldom the cause of much delay. Traces of Papuans we seldom found, only now and then a tumbledown hut or a notch in a tree. The following day the Dyaks told us that they wanted a day's rest, even at the loss of pay and half rations; we granted their request, and we utilised the time to collect zoological specimens and reconnoitre the route for the following day. The scouts had good news to report, and informed us they had seen, on the slope of a mountain opposite, Papuans who were engaged in making gardens, and who were burning a big fire. The day's holiday had done the Dyaks a great deal of good; the following day we mounted a great distance and camped in a most inhospitable region on a steep acclivity. We had already reached an altitude of more than 6500 feet, but it was now that our misery began. The ascent became every minute more difficult; we encountered steep, nearly perpendicular walls, fortunately thickly covered, the branches and roots enabling us to hoist ourselves up.

How the trees could possibly grow and thrive there is a puzzle; but, without them, we could not have climbed these steep rocks. At noon

we suddenly heard voices below us, but we could not make out to whom they belonged; had they been Papuans with hostile intentions, our position would have been far from enviable. Happily it proved to be Lieut. Habbema, adorned with a Dyak cap of plaited rattan, with a basket on his back. He had overtaken us with a great number of carriers, many of whom had to be sent back, because they pretended they could not possibly proceed any further; these were for the greater part Malays and Soendanese. Our combined parties now struggled hard to continue the ascent of the mountain, and when at four o'clock it began raining again, and we could not find a level spot to camp, the men were in low spirits. It was cold, and we had already reached an altitude of about 8200 feet, and were drenched with rain. Shivering with cold, we sat and looked at the Dyaks, who were engaged in constructing our house; but their progress was slow—the wood being bad, and many of them did not take part in the work, but made a kind of cave between the roots of large trees. They lighted big fires, and some of them made a kind of seat on which they sat and warmed themselves. Rain is greatly disliked by them, and on such days they are bad tempered. After some delay our house was ready, but by that time their energy was exhausted. It goes without saying that we shared our house with many of them; owing to want of space, the others found a place in the above-mentioned caves or under a canvas they had spread over a couple of poles. Throughout the following day rain continued, which did not improve our situation. We made a calculation of the stores we had, which proved that there was not sufficient for the expedition to the Snow Mountains, and to leave a depôt behind, in case of accident. Tigang was therefore sent back to Alkmaar with a number of Dyaks, and was to return as soon as possible with a considerable supply of provisions. He did not disappoint us, for after eight days he was back again with a good supply. We had, in the meantime, also been active; we pitched camp some 230 feet higher, on a spot facing the north, from which in favourable circumstances we were able to make out the Wilhelmina peak. The former camp we had faced the south, and from this spot we could see the boundless plain, stretching towards the sea, intersected by numerous rivers, covered with primeval forests, and at the horizon a dim line indicating the sea. However imposing this spectacle might be, and however much it had often impressed us by its majesty, we were now fascinated by what we saw in the north, where the immense white wonder attracted us with irresistible force.

Not often did we find opportunities to enjoy this majestic spectacle. The morning hours were for this purpose the best, for later in the day the sun had caused so much evaporation that clouds rising up from the different valleys beneath veiled the imposing mountain. At sunset it sometimes became visible. On one occasion I saw it at night, by the faint light of the moon. Impatiently we awaited the arrival of Tigang, and that imposing sight tried our patience sorely. The camp stood on a spot where all the trees, for some cause or other, had died; a favourable spot no doubt, for when the sun shone we could enjoy the warm rays. The woods by which we were surrounded consisted of

trees, thickly covered with moss, saturated with water, and therefore always dripping, so that in the wood one could not enjoy the sunshine, which was here greatly appreciated.

Such a primeval forest is always sombre and majestic; silence reigns supreme; only every now and then the rustling of a passing bird is heard, or the muffled sound of a toad buried in the ground. These forests are destitute of flowers, because the sunbeams are intercepted by the thick foliage of the trees; only an occasional orchid, beautiful and delicately coloured, is found, or the deep red flower of a Zingiber. The trees, almost to the end of the branches, are covered with moss, resembling gigantic candelabra; here and there traces of Papuans are to be found. In close proximity to our bivouac stood a hut composed of bark of trees, filled up on all sides with branches and sand, to keep out the cold wind; in the middle a hearth over which was a kind of structure, probably used for roasting purposes. Traps for rats and mice were frequently met with. Quite near the snow-line we found these traps, which proves that Papuans also visit these regions, probably when traversing them.

On October 27 the great expedition began; as "Dritte im Bunde," Lieut. Habbema accompanied us with 27 Dyaks, 2 fusiliers, and 2 convicts. We had calculated that we were provisioned for 17 or 18 days, when the ration per man was reduced from 0·8 to 0·6 kilogram (1 katti). Only after much consideration did our men consent to this reduction of their ration; but the fact that but for this reduction the expedition would be impossible, made them consent. The time was to come when the rations were even more reduced. Upon starting again the Wilhelmina peak was better visible than ever, which we considered a good omen. First we descended a steep slope and then mounted again, to reach the Treub Mountains. The way was not difficult, and the men were full of courage, a situation in which they are always apt to see the sunny side of things. We followed the crest of these mountains for a long time; they were covered with stunted trees and a marshy soil. Here we had our first bivouac, almost opposite to that on the Hellwig Mountains, which were hidden from our view by clouds. The following day was clearer, and we could see the tins we had hung in the trees to serve as a guide glitter. The clearing we had made in 1907 was also visible. Gradually we reached a less barren region; the plants were chiefly long, thin bamboos, with leaves of lancet form, and formed a decoration to the scenery. Slowly advancing, we left the crest of the mountain range, which had a east-west trend, and followed a ridge stretching to the north. In front of us we saw a vast valley, covered here and there with Papuan settlements and houses in course of erection; in the wood we found occasional traces of Papuans—a beaten path and notches in the trees. Most probably we were to encounter a tribe about whose intentions we were in ignorance. They might be the persons who in 1907 had attacked our camp at Alkmaar. This was for us a fact of vital importance, for to make an expedition with the knowledge that one has a hostile tribe behind is far from agreeable. That day a Dyak saw a Papuan piling wood. Upon seeing us he disappeared in the forest, and attempts to enter into con-

nection by means of cries were ineffective. We therefore decided to proceed on our way calmly and to leave matters to chance. The part we climbed in the afternoon was most difficult, because we found many steep acclivities in our way, and at four o'clock we were completely knocked up, and had to search for a camping-place. The spot we reached was unfavourable, but Tigang, who had followed a Papuan path, came with shouts of joy to tell us that in the vicinity of a Papuan hut he had found a suitable place. It was certainly a good spot; the ground being even, with a limpid streamlet near by. This hut was immediately taken possession of by a number of Dyaks. During the evening and night a strict watch was kept to be prepared for all eventualities. Nothing happened, however, and the following day we continued our march in a northerly direction. We had not marched for an hour before we heard some person cry behind us. It was, of course, a most critical moment, because we did not know the intentions of the Papuans. The carriers were sent ahead, and those who carried arms assembled in the rear. We soon perceived that the Papuans did not come with hostile intentions. They made peaceable gestures, and after much hesitation they approached, offering us roasted yams, and inviting us to follow them to their settlement. Although our provisions were not sufficient to allow us such trips, we decided to grant their request. They seemed to be of a peaceable disposition; they were much surprised at the sight of our shoes, and our garments, which they thought highly interesting. For persons living in the Stone Age, it is of course a tremendous leap to meet with persons of our civilisation. Their costume was very primitive, and was limited to a few ornaments round neck and wrist. The typical bag was also to be found among these Papuans; their bows and arrows greatly resembled those they had formerly left behind on the occasion of the above-mentioned attack on Alkmaar; the stone axes had also the same form. We followed them along a beaten path across gardens and enclosures, in which they kept hogs, even spotted ones, utterly unlike the wild boars we had seen in the forests. Dancing cheerfully and talking nervously, the Papuans led the way to a settlement consisting of a group of houses, where we were received with a kind of song by the people who had stayed behind. Women and children were invisible, but we perceived them peeping through the crevices of the houses to satisfy their curiosity, a curiosity in every way justified, I think. They exchanged signals which we did not understand. It is rather unpleasant to be obliged to answer, after a Papuan has delivered his speech in a language one does not understand. We tried to point out to them the object of our expedition, but they would not allow us to depart; for what reason we did not know. For a moment we gently tried to force a way, but their attitude became so menacing that we decided to pass the night there, though our position was far from enviable.

Chiefs there did not seem to be; those who talked most seemed to be the most influential persons; one among them, whose goodwill we had bought by means of an old straw hat of one of the Dyaks, seemed, thanks to his volubility, a person of great authority. When the Papuans saw

that we intended to stay, their attitude towards us changed at once. They most willingly lent us a helping hand to fetch wood and water. A rather comical fact was that they took one of the young Dyaks for a woman. This tribe of Dyaks, with their long hair and clean-shaven face, certainly resemble women, so that after all their mistake was to be understood. This Dyak was especially favoured with their assistance, and he was clever enough to exploit this kind of courting. Afterwards the preference shown to him was a source of great embarrassment to us, because the Papuans insisted on keeping him as a hostage, and many gesticulations were necessary to make them give up their plan. We soon perceived why the Papuans wanted us to stay, for a great ceremony was being prepared. We were invited to take a seat near a big fire, in which they had heated a mass of stones; next, two small hogs were shot through the heart, the blood was collected in leaves and then smeared on our foreheads, while in the meantime they uttered all kinds of formulas. The Papuans present, among whom we now perceived women and children, were treated similarly. In this manner a kind of kinship was contracted; and when later long speeches were delivered, they always pointed to their foreheads. After this ceremony the hogs were cut into pieces with a sharp bamboo stick; the pieces were then wrapped in leaves, placed in a pit, and covered over with the heated stones. The pit being filled up, in this manner the meat was roasted; half an hour after it was opened and Van Nouhuys and I were invited to distribute the meat; I cannot but say that it proved very appetising. In this way we became friends and remained so afterwards.

For the Papuans as well as for us, many remarkable things were to be seen; they became acquainted with the use of matches, whereas we learned how by friction of rattans one can make fire. They saw how rice can be boiled in pots of aluminium; we how, by means of heated stones, meat can be roasted. The chief article of food with the Papuans are sweet potatoes which they grow in their gardens; further they have bananas, and for meat hogs and the animals they hunt. They soon learned to appreciate rice; their stone tools they handle with great skill, and iron was not much sought for by them, as, no doubt, it did not look strong enough. They will soon learn the value of the few iron things they got in exchange for other articles. Clothes were in great demand because the nights were very cold; they lit fires to warm themselves, but quickly felt the pleasant effect of warm clothes. As a peculiarity I am bound to mention that they grow their own tobacco and use a kind of small tobacco-pipe. The tobacco is dried by means of hot stones; that we find tobacco here is all the more remarkable, because the tribes along the North River do not know this plant. It might, therefore, be supposed that they have communication with the inhabitants of the north coast. As they also wear sea-shells (melodiadema?) round their necks, and pretend that they receive these from the north coast, this conclusion does not seem absurd. After much deliberation they at length allowed us to proceed on our way to the north, but they would have been more pleased if we had accompanied them to the settlements, situated more to the eastward. The following day we were seen off by a number of Papuans, who first performed a kind of dance for us. They accompanied us a long way, and pointed out that on

our route to the north we must not deviate from the way. Gradually rising, the way led in the right direction, while we could, for a great part of our route, make use of a kind of path. The visit we had paid to the Papuans had obliged us to descend to an altitude of about 5500 feet, but now we were soon as high as the Hellwig Mountains again, an altitude of about 8200 feet. The spot where we were to camp that night was a primeval forest, covered with thick moss, on the slopes of a mountain; the ground here was very uneven, and thick roots made it difficult to march or even to stand. The Dyaks rigged up a tent in which we soon forgot the fatigues of the day; they had by this time fully understood the importance of our enterprise, and never thought of asking for a day's rest. The following day we reached an altitude of over 9800 feet; the primeval forest was left behind, and we were now on the crest of the great massive Wichmann Mountains, with scanty vegetation, strewn with stones, and here and there a pool of stagnant water.

The weather was gloomy and misty, and the cold rain made us feel very uncomfortable. Unexpectedly we met Papuans here, two or three men with a woman and a drove of hogs. We did not find any traces of a house. These Papuans had probably come here to find food for their hogs —which effort proved in vain. Though we acted with great prudence, we could not enter into connection with these people, at least not for the present; they did not run away, however, but calmly continued their way. In the heart of the mountains, in close vicinity to a little lake, we bivouacked, building a kind of hut of sods; the canvas was stretched as low as possible and the gaps filled up with branches and heather. Small fir-trees and the cold reminded us of Europe. Later in the afternoon we entered into connection with the Papuans, who even entered our tent. These people go about without any clothes; only when it is raining they protect themselves by a mat, plaited from pandanus leaves, also called screw-pine. All along the route we saw remains of fires they had lit to warm themselves. With our new acquaintances from the valley, who called themselves "Peseguems," they seemed to be on anything but friendly terms, for the words we had learned there did not meet with a good reception. Our new friends had warned us that we should encounter a tribe who would receive us with arrows and stones. Yet we got on fairly well together; they received some presents from us, and gave us in exchange ethnographical articles, and then, without any notice, they gave everything back, claiming the things we had exchanged, and disappeared for ever.

We decided to stay a day in the so-called Wichmann Bivouac, hoping that the following day might bring better weather to enable Van Nouhuys to make the necessary observations, while I decided to collect zoological specimens. The weather remained bad the following day; only in the morning the snow peak stood out more clearly. That we were nearing it, and gradually rising, gave us great satisfaction. The following day we marched a good deal, because the regions we had to traverse were favourable; they were rather bare, so that it was not necessary for us to cut our way. The landscape was hilly, but our men were in good, hard condition. While the bivouac was being made, I had the good fortune

Mountain Papuans (Peseguem Tribe).

to capture two specimens of the important Peripatus, hitherto unknown in New Guinea.

We neared Wilhelmina peak, though we did not rise very much ; our hypsometer registered in the evening an altitude of 10,820 feet. In the daytime it was not cold ; when moving about one is not inconvenienced by the cold, but at night jerseys and woollen blankets stood us in good stead. It should be borne in mind that we slept in open tents ; the Dyaks kept a fire burning which was rather smoky, because of the damp wood; but we knew that they could not do without it. When camping on the Hellwig Mountains they followed another system ; there they preferred sleeping in the daytime, and at night they sat talking round big fires, for which they had collected the wood beforehand. During the march of course this could not be done. The authority of the chiefs was also perceptible during the march, for they had no loads to carry, and did not take part in the building of the bivouac. It is true that they did some work for ourselves ; as for their food, their portions were none of the smallest, I think. The 4th of November was an exceedingly fatiguing day ; our way led over steep rocks, which had to be crossed on all-fours, a false step meaning death. We camped at the foot of a steep wall, where falls of icy water came down ; we knew that we were near the summit we longed to reach, but it was impossible to see it. Slowly, step by step, we continued our upward journey ; the scenery showed itself in all its ruggedness, the ground was stony, covered with rocks or thickly grown over with shrubs of hard, tough wood, through which it was wellnigh impossible to force a way. We were even obliged to send two men ahead instead of one to cut the path. On the unprotected plain a cold icy wind blew which greatly added to our discomfort.

In this desolate wilderness I unexpectedly saw two partridges fly up, one of which I had the good fortune to bag ; the plumage of this bird, together with a great number of stuffed birds, has by this time found a place in the museum of Leyden. In the evening we feasted upon a delicious partridge, which had been roasted together with an old and tough bird of paradise. There was not much variety of food ; the chief article was rice with a few tins of mixed food, and from time to time preserved fruits. To live on the produce of a primeval forest is but an illusion ; fruits there are, so to speak, none ; the amount of game is small, making it impossible for so many men to feed upon it. In the plains, where sago-trees grow in profusion, it would be possible to find food for many people ; but this useful tree does not grow in hilly regions. In the afternoon of November 6 a wellnigh perpendicular wall unexpectedly barred our way ; continuous fogs made it very difficult to see the route we had to follow. An attempt to mount this wall failed, because of the steepness of the rocks, we were therefore obliged to make a circuitous route in order to find a place where we could descend. At last we succeeded, and it took us more than half an hour to construct from a tree a kind of contrivance which enabled us, with swinging and rolling, to lower ourselves. In this manner we reached a vast valley, the trend of which was east-west ; it was intersected by a streamlet of limpid, cold water, draining off the snow ; we again experienced difficulty in pitching a camp without

the necessary wood for supporting the tent, so that we had to have recourse to the blowpipes of the Dyaks, who had brought these all the way and not only used them as weapons, but also employed them when steep slopes had to be climbed. At night we were suddenly roused from our sleep because part of our tent collapsed. As every one joined in the work the damage was soon repaired. The temperature had during the night fallen to a few degrees above zero.

The following day, November 7, we encountered the first snow on our way; our feelings may be easily imagined; we had almost attained the end of our expedition. The Dyaks soon made snowballs, which they intended to take to Borneo. If possible our route became still more impracticable; boulders, deposited here by former glaciers, barred our way and compelled us to proceed slowly. At noon we therefore decided to camp and to reconnoitre the surroundings. I believe that it would have been impossible to camp at a higher altitude for want of the necessary materials, chiefly wood, which had to be fetched from the valley beneath, a work the men thought anything but agreeable. We had reached an altitude of about 13,200 feet by this time; a beautiful old glacier lake, with steep rocks on which the scratches made by the glacier were clearly visible, enhanced the imposing grandeur of the scenery, but of the Wilhemina peak nothing was to be seen. We were still full of energy, and decided to start early the following day.

November 8, the most remarkable and at the same time the most unfortunate day of the expedition, dawned. Accompanied by Van Nouhuys, I set out, while six Dyaks of their own accord followed us. Fortunately the weather was clearer. On the steep wall of rock leading to the summit we saw here and there large white fields of snow. To mount this wall was out of the question; even a cat could not possibly climb it. Our route led us along a glacier lake, and we arrived at a kind of valley, impassable from a mass of stone blocks scattered in all directions; but as we were determined to continue our march, nothing could prevent us. The wall of rocks looked as insurmountable as ever, but suddenly we saw a crevice, through which, with great difficulty, we forced our way upwards. At last we were on the wall we had longed to climb. Rising in an easterly direction, it led us to the eternal snow lying ahead and sparkling in quiet magnificence. How this wall led us to the summit I cannot tell, but we arrived there, and, intoxicated with joy, we trod the snow. After tremendous difficulties we had reached our goal; and at length the secret had been unveiled, that it is snow and not chalk or some other substance with which these mountains are covered. Our hypsometer registered 15,125 feet; by way of comparison, I mention that the Mount Blanc has a height of about 15,750 feet.

I wish that in making mention of our success I might conclude my story, but alas! this cannot be, for many days of trouble were in store for us, days of want, days on which death stared us in the face; days throwing a dark shadow on our success. It was now time to think of our return journey. Along the steep way we had to descend dexterity and caution were needed. To the north we had a free view uninterrupted by higher mountains; only lower mountains stretched to the horizon,

Wilhelmina Peak (Nov. 8, 1909).

To left Captain van Nouhuys, Dr. Lorentz in the middle, and Dyaks to right.

Wilhelmina Peak, Orange Mountains.

(From a Drawing by Captain van Nouhuys.)

which, saturated with vapour, lost themselves in the dim distance. A lake in front of us we named after our faithful comrade, Lieutenant Habbema. Thinking that I had reached the crevice through which we had mounted the wall of rock, I descended, but when I was half-way down I saw that it was not the same spot; but as the situation did not look unfavourable, I decided to descend through this crevice to the plain. The bottom, on which I stood, appeared, however, to consist of loose sand and stones, on which, sliding down, I soon lost my footing, and, rolling down like a stone, I fell into the abyss. For Van Nouhuys, who stood on the verge, this was no doubt one of the most horrible moments of the expedition. By following the right path he had soon reached me, finding me in a swoon, with a broken rib and bruised limbs. Our miserable condition can easily be imagined; I was unable to walk, and it was too late to send to the camp to fetch means of transport: we were obliged, all three of us (a Dyak, Adjang, had stayed with us), to sleep in the open, sheltered only by a large boulder. Around us everything was covered with snow.

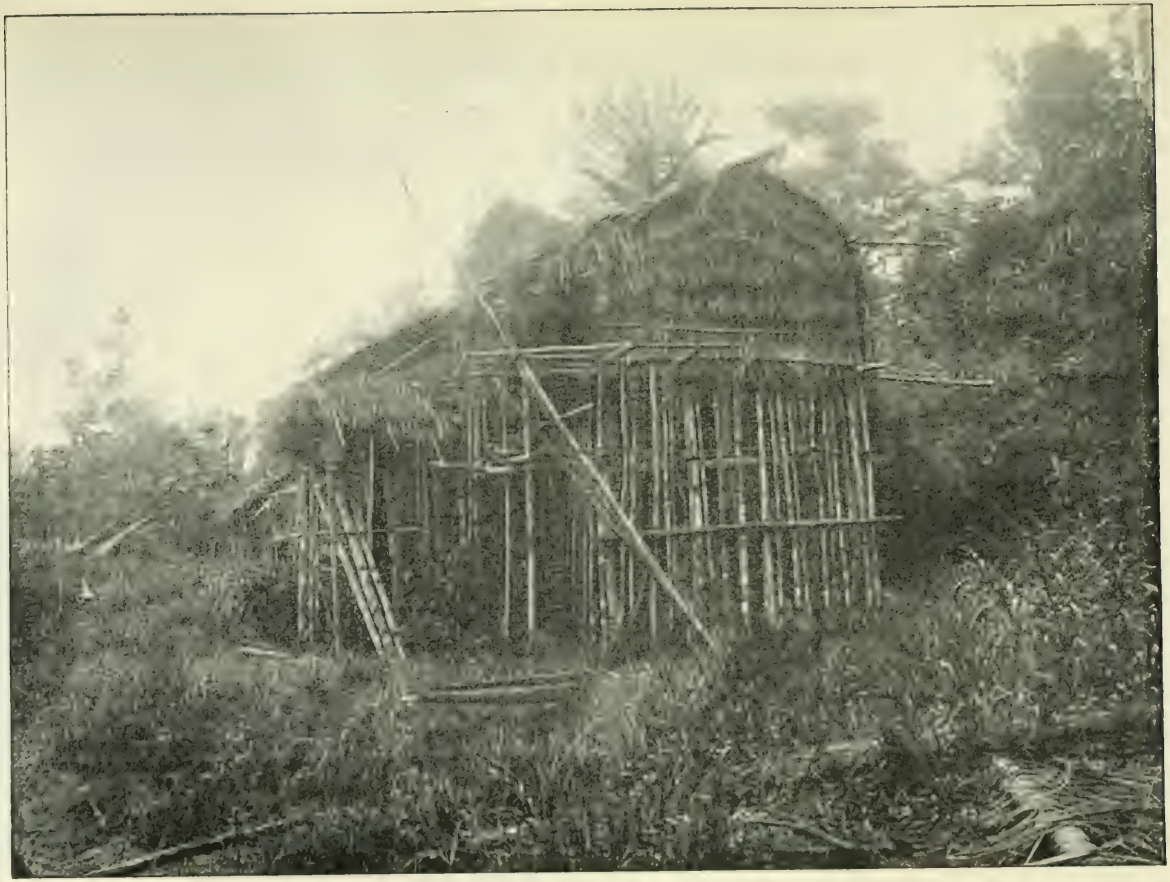
I am not able to dwell long on the misery that followed—the long night and the endless wait for the help for which we had sent. Then followed that painful transport across the barren regions, and, as a climax, we heard upon reaching camp that one of our Dyaks had stayed behind, and it appeared that, benumbed with cold, the unfortunate man had been frozen to death. These are terrible reminiscences which Van Nouhuys and I do not like to recall. At night there was a violent shower of snow: our tent was completely buried, and a tent of the Dyaks collapsed. It was a series of miseries, but at the same time I received many proofs of friendship from Van Nouhuys and Lieutenant Habbema, who did all in their power to assist me. For the present it was impossible for me to continue our march. Lieutenant Habbema started with a number of Dyaks to fetch fresh supplies of rice from the depôt on the Hellwig Mountains, which now stood us in good stead. With Van Nouhuys and some Dyaks I stayed behind in the so-called "temperance bivouac." As we were not provisioned for such a long stay, the rations had to be reduced and finally dwindled down to one ounce of rice per day, without any sugar, salt, coffee, whereas every day our strength was taxed to the utmost. Our enforced stay lasted until November 21, when I was able to walk about 500 yards, with the greatest difficulty; but, aided by Van Nouhuys, we slowly proceeded. When ascending the mountains we had found the way very difficult. What we had to endure now on the return journey may be easily imagined. The Dyaks, not accustomed to living on so little food, were in a pitiable condition: most of them suffered from sore feet. To bandage them was of no use, because they lost the bandages when marching in these bad regions. One of them had frost-bitten toes, and had held them in the evening too close to the fire, with the result that they had mortified, and during the march fell off. On November 25 one of the Dyaks died of exhaustion, while many others in their state of semi-starvation were likely to follow. However miserable we might feel, we had in the evening to inspire our men with new courage. Every day we calculated how far Lieutenant Habbema could have proceeded, and

when we might reasonably expect the relief party. On November 26 we unfortunately followed a wrong path, which led us into a kind of crevice, the steep walls overhead nearing one another. One felt as if in a large trap. Fortunately this caused us only the loss of a day, but, more than the loss of time, we regretted the quantity of rice we had consumed.

We tried to convert the young fronds of the polypodies into food, but prepared without salt these gave only a mucous, hairy substance. We generally started about eight o'clock ; before our departure each of us received a plate of soft-boiled rice, the only food we had the whole day. It is unfortunate that during the first days one can't help thinking of food, and these thoughts make it wellnigh impossible to sleep. Happily these thoughts disappear after some three or four days, and one walks on in a kind of apathy. About ten o'clock we were generally obliged to pitch camp, being unable to march farther ; and then we had before us a long day and night and no means to occupy our time.

Finally our men were so exhausted that, although we had taken with us only absolute necessaries, we were obliged to leave our instruments behind, which grieved us sorely, as may be easily imagined. On November 29 another horrible discovery awaited us. By the wayside we found a soldier belonging to Lieutenant Habbema's party, who had lost his way and had been lying there for fifteen days without any food, a thing almost past belief. The man lay by the wayside, and if he had only followed the route he would have found from time to time rice which Lieutenant Habbema had left for him. What grieved us most was that we could not take him with us nor give him any food. In the afternoon of the same day we suddenly heard cries coming from the direction in which we had to march. At first our thoughts turned towards the Papuans, but soon there appeared seven Dyaks, who came to our rescue by bringing us provisions. In the excitement of the moment they fell on our necks, and we, too, were deeply moved. They were the first of a party of forty who had been sent by Lieutenant Habbema from Alkmaar to bring us provisions, and had covered the distance in a remarkably short time.

In the evening there was a great feast, and every one partook of a square meal. The first thing we did was to send some men to fetch the soldier we had left behind ; they found him still alive, but he died while being transported. The expedition to the Snow Mountains thus cost the lives of three men. I will not enter into details about our march back. Everywhere we found in the camps more provisions, communications between Alkmaar and our party being restored. Proceeding slowly, we then realised what we had performed and what we had suffered. Our friends the Papuans received us cordially ; we bought from them a young hog, of which we made a good dinner. On the Hellwig Mountains we found Raden Jaarman, who could only state that my rib was healed. On the plain the general state of health had been so favourable as to allow him to leave the *Eagle* and to ascend the mountains, where he sat, shivering with cold, musing on sunny Java. Descending the Hellwig Mountain, we found that, thanks to the exertions of Lieutenant Habbema and the Dyaks, the route had been greatly



Papuan House near North (Lorentz) River.

improved. Rattan railings had been made ; in steep parts steps had been cut, and every stream had been bridged over. It was a splendid piece of work.

On December 15 we arrived safe and sound at Alkmaar, which had been decorated by those who had stayed behind under the command of Dr. v. Römer. After an absence of sixty-eight days in the primeval forests, we again enjoyed a good bed, but at night we were roused from our sleep by an inundation of the river, which took its course through a part of our camp. Fortunately the rise of the water was of short duration. Measures were taken now to embark on board the *Eagle*. The Papuans with whom we were on friendly terms visited Alkmaar, and were greatly astonished at what they saw there. While we were waiting for the ship which was to take us back to Java, the *Eagle* was decorated by the Dyaks in their peculiar way.

For the rest we beguiled our time by paying visits to the Papuan campongs down Bivouac Island, with the inhabitants of which we were always bartering. The Government's steamer *Java* came to fetch us, and after a short visit to the English expedition on the Mimika River, towed us back to Java and landed us there. Here the expedition was dissolved and belongs to the past. Let us hope that the interest aroused in New Guinea may increase, and that many a scientific expedition will make this island the scene of its explorations.

A few words about the scientific results of the expedition. This is not the place to expatiate upon them ; those who interest themselves in the subject can find full details in *Nova Guinea*, a work containing the results of the expeditions of 1903, 1907, and 1909, of which many parts have been already published.

Zoology.—More proofs have been gathered that New Guinea belongs to Australia, especially concerning the fishes found in the river. I will mention a curious fact we observed. The male of *Kurtis gulliveri* takes care of the eggs by fastening them on a hook that grows on his occiput ; the eggs are attached together by means of a string. A collection of nearly a thousand birdskins was brought together. Dr. van Oort, of the Leyden Museum, is making this his special study, and it appears there are many new species (see "Notes from the Leyden Museum," vol. xxxii. p. 211). Over ten thousand insects were collected and are divided amongst able specialists.

Botany.—The results of this expedition prove that in New Guinea transitions can be found from the genuine tropical to the alpine flora. The majority of plants have, however, a Malayan character, but there are such a great number of endemic forms that New Guinea and the adjacent islands can be separated from the Soenda Islands as a dominion in itself (Papuasia). On the south coast there are extensive marsh woods, like those found elsewhere in India. When the soil is more solid, we found here and there savannas, consisting of intruders from North Australia (Acacia, etc.). The alpine flora has a northern character, not like the Australian flora, but resembling that of the mountains of Java, Sumatra, and the Himalayas (Rhododendron, Ericaceæ, Viola, etc.).

Geography.—The south coast consists of a large alluvial plain, some-

times miles in width, cut by a great number of rivers, which drain it and bring its abundant waters to the sea. The trend of the hills and mountains is principally east-west, which causes great trouble to explorers, as the ridges cannot be followed, but always have to be crossed. During the expeditions of 1907 and 1909 eruptive rocks were not found. The mountains we crossed proved to be of recent formation. The Wilhelmina peak consists of alveoline limestone. Eruptive rocks have been found near Geelvink Bay. The Wichmann Mountains consist partially of sandstone. Concerning the snow, I may mention that we did not meet with real glaciers—the heat of the tropical sun must prevent their formation —but we found many traces (the above-mentioned lake and scratches on the rocks) that they have existed. We saw on the top of the Wilhelmina peak the so-called *firn*.

Ethnology.—A distinction must be made between the Papuans living in the plains near the river and those in the mountains. The river Papuans live chiefly on sago and bananas, and have as animal food hogs, fish, kangaroos, cassowaries, etc. As sago does not grow in the mountains, these Papuans eat principally yams and bananas, and also hogs, rats, and mice. Both of these tribes live in a typical Stone Age. Their arms are bow and arrows, spear, club, and stone axe. Their arrows are not poisoned. None of them wear any clothing; not even the people who live above 10,000 feet. It is remarkable that they do not know the use of bark. I am not convinced that they are cannibals. I collected about eighty human skulls, and on asking a native where the remaining portions of the skeletons were, he gave me to understand that they were eaten. It is possible that he misunderstood me; still those skulls are valuable from an anthropological point of view, as we can be sure that they belong to a race which is free from mixture with other races. Besides their weapons, they never go out without their bag, containing tools for daily use. They give evidence of great skill in making their canoes with stone axes. I happened to be in their village when they were busy with their work, and they soon understood the superiority of iron tools.

NOTES ON CHANGES IN THE HIGHLAND DISTRICT OF APPIN ON TAYSIDE.

By John Stewart, Junior, Tegarmuchd, by Aberfeldy.

(*Continued from page* 291.)

Industrial and Agricultural Changes.

These have affected the whole population—those engaged in agricultural and non-agricultural work. I begin with the latter class.

The parish of Dull is divided into two parts, the parish landward (of which this is the home division), and the parish burgh (Aberfeldy), with Weem parish between. The burgh and the rural districts

have completely altered their mutual relations in the course of the generations. In the beginning of the eighteenth century Aberfeldy was merely a hamlet of a few black houses, while Dull and Weem were centres of some consequence, as understood at the time. Wade's Bridge gave Aberfeldy a fillip in the eighteenth century, and in the nineteenth the railway made it a small town. As far back as I can remember, these places have been in the Aberfeldy district; in my grandfather's and even my father's time, Aberfeldy was in the district of Weem. At Weem the Courts were held. It was the polling centre of several parishes, and so on. Everything except farm-work is centralised in the burgh. It has our banks, our shops, our auction mart; and—barring a few estate workmen—our joiners, masons, plumbers, slaters; our tailors, shoemakers, weavers, etc.

Now, in referring to the decrease of the rural population, many writers are apt to think it has come about owing to the smaller number of people on the farms. That is only part of the truth. While the agricultural workers are fewer, the other class of workers has gone from the parish landward entirely. The burgh has increased; the landward part has decreased.

In addition to the villages of Dull and Camserney, a row of cottages stood beside every farmstead. My father remembers when there were three schools instead of one in Appin; four smithies instead of one; at Camserney, where only the sawmill remains, there were a meal-mill, a wool-mill, a lint-mill, and a whisky-mill. He knew quite a large number of hand-loom weavers, tailors, shoemakers, joiners, cartwrights, drystone dyke-builders, masons, and general labourers. Those people, most of them, besides working at their trades, did a little at the farms on special occasions, such as hay and harvest time. Indeed many of them had their cottages from the farmers and paid the rent in work.

Those were the times before the shootings became valuable. One gamekeeper looked after the whole valley, a little creature whom many a man could carry to the top of Dull Rock on his back. A number half-lived on poaching of every kind. The old Gaelic saying ran—"It's no great sin to cleek a salmon in a pool, or snare a hare in a thicket." It was after the day of cattle-lifting, however, and it could not be true in the sense meant by Bailie Nicol Jarvie, that the one half lived on the land and the other half on plunder.

Those were also the times when the Chancellor of the Exchequer did not require so many millions, when the Government was not all-seeing, and the revenue officers not always invincible and incorruptible; when the parish was continually searched for hidden treasure, and nothing gave the country-folk more delight than listening to tales of gaugers belaboured or outwitted by smugglers. A Weem man fought in the "Battle of Corriemukloch," along Crieff way, where a party of Scots Greys, sent to apprehend a strong band of smugglers, stuck with their horses in the boggy ground, and had to return without accomplishing their purpose. My father's uncle—one of the then tenants at Tegarmuchd—was fined £50 (though not a smuggler himself) for aiding, along with several other men from here, a gang of smugglers in their

attempt to get their barrels into Perth by force, the most foolhardy feat ever attempted. One of his cousins suffered a year's imprisonment for smuggling. The last of the smugglers of the place is survived by a son living at Camserney.

Those were the times when crowds of folk went as harvesters to the south. Apprentices had a month's harvest in their bargain. They trooped off to the Carse of Gowrie, to Fife, even so far as the Lothians. The harvest in the south being early, they had that finished before starting the harvest here. Among those who used to go were Thomas Menzies, afterwards one of the national heavy-weight athletes, Lachie M'Intosh, a noted long-distance runner, my maternal grandfather from the sawmill, and a tailor, the only man of my time who told an old fairy story as true. In the year of short corn, '26, it was on the Dull Summer Communion Day, the second Sunday of July, that word came from the south to start—an early harvest indeed. The accommodation of the harvesters in barns and the like was only so-so, and it was a serious business for them in wet weather, as they generally got payment by results, and there could be no results while Jupiter Pluvius reigned. When hired for a month, the pay was a shilling a day—a fourth and no more of what has often been given even here. I am not aware that any serious charges were alleged against them. They were said to be famous orchard plunderers, some of them, but that is not to be wondered at in the case of people who never saw an apple when at home.

A word may be said of two industries carried on for a long while in the country. The one was the cultivation and manufacture of flax, or as it was called "lint." For the encouragement of this industry in the Highlands several lint-mills were put up throughout the country by the Government. The mill of this district stood at Camserney. Near the village, lint-ponds were constructed for steeping the lint—at one place in a bit of marshy ground, at another where water was diverted from the burn. My father knew all the many processes, from the sowing of the lint seed to the wearing of the lint shirt. The industry died off altogether fifty to sixty years ago. The other industry was whisky distilling. I do not mean the illicit still—in Gaelic, "the black pot," but the legal manufacture of the "water of life." The laird erected three stills in the strath, at Camserney, Tegarmuchd (Wester), and Coshieville. My grandfather, with several other farmers, had a share in the Camserney still. It perished about the same time as the flax business.

The little mercantile business the people had was with Perth, before shops sprang up in Aberfeldy, and every district had its Perth carrier, who also carried the business letters because of the excessive postage.

Neither my father nor my grandfather saw a quern going, and neither, perhaps curiously enough, saw or knew anything about quern-stones, so early did mills flourish by the burn.

While with a few exceptions mechanics and labourers other than farm workers have abandoned the parish landward, and are to be found only in the burgh, the agricultural section of the community, in greatly decreased numbers, has remained in circumstances greatly changed from what they were in the days of the forefathers.

As far back as my father remembers, the extent of tilled land has been practically as it is now; so, too, the division of the valley into holdings separate and distinct from each other, although, as mentioned already, the holdings were smaller, and consequently the tenants more numerous. Broadly speaking it was towards the close of the eighteenth century that the modern or present agricultural order originated.

In my grandfather's early life, there was no rotation, as we understand the term. The only crops were oats, barley, potatoes, and a patch of flax. Corn succeeded corn sometimes for three years; which would now be called mis-cropping. Subsequently grass seeds, rye-grass and clover, were introduced: hence rotation hay, as distinguished from meadow or permanent hay. The whole of the grazings on hill and braes were held in common; all the cattle, horses, and sheep of all the tenants grazed together. The arable land was in run-rig. A tenant had not his holding all in the same place and marked off by boundaries from neighbouring holdings as now. There was an endless succession of small bits or patches. A man never had his different plots beside each other: just a rig here and a rig there alternately, and never the same rigs for more than one year running. Every year he had a shift of ground, and that kept them all mixed up. Enclosures were unknown, and all had to unite in guarding the tillage, whether against wild beast or against wild man.

Again, there were no wheeled carts, only sledges or "carns." The carn-roads on which the peats were sledged down the hill may yet be noticed in certain parts of the braes. They are simply deep narrow tracks. Sometimes these are to be met with parallel to and close beside each other. When one became too deep it was changed.

The lairds erected corn-mills, and the tenants were "thirled" to a particular mill, that is, by agreement they had to send their corn to be ground there.

In those days, the money rent was probably not a third of what it afterwards became. Indeed, the rent was mostly paid in kind, or "kain" as it was called in the old farm leases, and in servitude—in cattle, poultry, peats, kain carriage, and work on the home farm. Even in my father's tenancy, long after the rents were raised, "kain carriage" continued to be in force. Before the coming of the Highland Railway, he was among those that had to do "kain" to Perth, going for coals and other things required at Castle Menzies, and to Craiglea Quarry for slates. The tenants had also to cart the oak-bark to the tanneries at Crieff, Perth, and Kinross. A few head of poultry continued to be given in: that was an insignificant item latterly. So many cart-loads of peats formed another item: the laird's peats, in Gaelic, the Lord's peats. The Gael was then very loyal to his chief. Yes, but all the same, he learned long before the discontinuance of peat-casting, to give the brown or yellow, the inferior light kind, and to keep the black and hard peats for himself. On one occasion the laird, accompanied by another gentleman, was passing over the hill. Coming to a stack of brown peats, he said to his companion, "These are the peats they will send me. They're easily known."

My father has certainly witnessed changes in all directions. A systematic succession of shifts or rotation has been established. Oats, green crop, *i.e.* potatoes and turnips, barley, hay—the four-shift or original form of regular rotation. To hay, well within his recollection, succeeded a fifth, pasture, partly owing to the deterioration of the rough or permanent pasture on the braes, partly by reason of the falling value of grain, and the high prices ruling for cattle. In his time the flax business has gone, rye, too, has been given up, and now barley has almost disappeared. Far more land used to be under potatoes. Owing to cattle-feeding the green-crop is now almost all turnips, and yet he remembers when turnips were first sown in the district. A very small piece of ground was set apart for them ; they were so rare and precious then that the younger folk used to go to the fields to steal a turnip just as they would go to an orchard to steal apples.

A lime-kiln was then possessed by nearly every tenant, and lime universally applied to the land. The quarry was up on the hill about three miles above Coshieville. In his time artificial manures have come in. Stone dykes acted as boundaries and fences above the road, but he remembers when there was not a fence of any kind on the haugh between Wade's Bridge and the Point of Lyon. Before the introduction of wire-fencing, every holding, great and small, had its herd. There he stood, stick in hand, and nothing on his feet, keeping the cows out of the corn. It was supposed that he did not put them out of it, *i.e.* did not let them in. It was an easy, a healthy, and a wearisome job. When wire-fencing became partially the fashion, and he had only a side or two to watch, the work was not nearly so constant and he was not always at his post. Sometimes he slept, naturally enough, being out from early in the morning till late in the evening; sometimes he "guddled" in the burn, or ditch. Of this the cows would be sure soon to take advantage, and he would then be in a hurry. In the race the kye generally had the best of it. At stone-throwing he was an adept. In almost every byre, or on almost every pasture, a cow might be seen minus a horn. An irate farmer once asked his son, who herded, how one of the cows got a horn knocked off. The boy, not quite so truthful as young Washington, replied: "There was a strong gust of wind just now, and if that did not do it, I don't know how it happened." For the season of five months or so before the crops were secure, the hired herd-boy received in wages £1, afterwards raised to £1, 10s., and his food.

Among farm animals, the black-faced sheep have kept their place on the moor from time immemorial. The old Highland cattle are gone, having been supplanted by the short-horn and Ayrshire breeds, in turn partly ousted now in these districts by the black-polled, the hornless "black doddies." The old Highland breed of horses, the small light Highland garrons, are gone from these arable farms at least, and their place taken by heavier Clydesdales, not pure, however. As far as my observation goes, grey is the most persistent colour in horses. My father remembers when hardly a grey or white horse was to be seen in this vale. They are quite numerous to-day. Our grey mares have almost always grey foals, whatever the sires, but very seldom is there a

grey sire. That is intentional. The colour is unpopular with farmers; white horses are more difficult to groom, the least dust showing on them. As ever since we came here, all the horses, the two pair, have been grey or white, Tegarmuchd has been occasionally known as "White Horse Farm." My father was the first tenant-farmer in the district to get a set of leather harness. He has seen the clumsy iron graips and forks, etc., made in local smithies, replaced by superior steel articles. He has seen the horse-rake take the place of the hand-rake for collecting the rows of hay, the coming of iron-harrows, chain-harrows, grubbers, cultivators, drill-harrow, double mould plough, etc.

Very remarkable have been the changes in connection with threshing and harvesting. When he began his tenancy he had no threshing-mill. He threshed with the flail. I never saw one. Their use being over, they soon vanished, as they were simply two long sticks tied together by a leathern thong. The old barns were specially constructed with a view to the kind of threshing in vogue. In this strath, practically all the houses, farm-houses, as well as steadings, were placed east and west, with the front facing the south. But on every holding stood one house by itself, north and south, with a door on each side exactly opposite. The reason was that in this country the winds are generally across country, east and west, and when the corn and the chaff together lay on the barn floor and had to be separated, the two doors were opened, and if the wind was blowing, whether east or west, entering one door it would drive the chaff out by the other: "the chaff which wind drives to and fro." The flail was hard work, and took a large amount of time. On big farms flailers were employed for the purpose.

In harvesting, the methods have altered more wonderfully still. My father remembers when all the corn was cut with the sickle. "Oft did the harvest to their sickle yield." Then they took the scythe for it. Then the reaping-machine astonished the rustics with its whirring and rapidity; and, within the last few years, to crown all, steps in the binder. From sickle to binder: it tells its own tale.

While mechanical inventions and appliances have benefited the farmer immensely in one way, enabling him to carry on his business with fewer hands at a time when hands were beginning to become scarce, in another way they have injured him. Coach-horses, of which so many were required when big hotels sprang up on the opening of the Highlands in the last century, have been driven off the road by the motor car. That means far less demand for hay and corn.

Buying and selling, too, are now conducted somewhat differently. The establishment of the auction mart in the country has had a good deal to do with that. Prior to its obtaining a footing, all the cattle, etc., were bought by travelling drovers, or were sold at the great fairs and trysts which were then numerous. Those fairs, "feile," were generally held half-yearly, the greatest towards the end of the season when the stock came off the grass. The most famous fairs near us were those at Kenmore, held monthly, and the yearly three-day fair—"Feile-Kate" (Kate's Fair), held, the first two days at Fortingall, and the third day at Coshieville. Big crowds of people—for the country districts

that is—gathered at them. Country-folk then were more easily gulled. Sharpers and cheap-Johns did a roaring trade.

A decided change for the better remains to be recorded in another direction. The standard of living is higher, farm-servants are more humanely treated, and no farms known to us have the bad name for unsavoury meat that obtained in other days, especially on upland holdings, where "braxy" mutton was common.

Changes in Customs and Beliefs.

"The Highlander, whose red claymore
The battle turned on Maida's shore,
Will on a Friday morn look pale,
If asked to tell a Fairy Tale."—*Scott.*

Perhaps the most striking feature in modern Highland social life has been the passing away of the "ceilidh" (pronounced somewhat like "kaily")—a call or visit. In its palmy days it was not merely individual visitation: in the long winter evenings people went in bands from one house to another, generally a night in one house, another night in another, and so on, the women taking their spinning wheels with them. All the talk presumably was story-telling, stories of supernatural beings and manifestations, fairies, witches, ghosts, apparitions, second sight and the like. It is remarkable how little passing events engaged the attention, neither was much interest taken in the traditional tales of their national history, the conflict of clan with clan, and in latter days the collision of the tartan and the scarlet, as at Killiecrankie and Culloden.

Young children, listening to these weird stories, got their minds so full of "bogies" that fright prevented their venturing out alone in the dark. Many adults were not much better. No man when alone by night would say, "M'Raw, give me my horse"—for fear he should be carried off on horseback to Fairyland.

The tailor already referred to, who died fifteen years ago, aged eighty-five, used to say that many of the fairy-tales were not true. One, however, he could give as absolute fact. It was what was well known at the time to have happened. A smith at Coshieville while out on the public road one night was suddenly lifted off his feet, and carried to the Bridge of Balgie in Glenlyon by an invisible party of fairies.

In this part of the country the belief in fairies and witches died long ago. Other beliefs lingered on, such as the Evil Eye, and peculiar notions as to diseases of cattle. Perhaps the "second sight" and the belief in apparitions or spirits have been the most persistent and have survived longest. Even in my own recollection a woman lived near Tummel Bridge who was credited by many with the gift of seeing things that happened elsewhere. The friends of two men who were drowned within a few years of each other in the Tay went to her, inquiring in what place the bodies were to be found. She was successful in the

first case and it caused a great sensation: the second was a failure, her upholders merely saying she could not be expected to see everything.

Another old belief may be mentioned. It was firmly held that "water-bulls" existed in Loch Tay. They were said to have come occasionally to where the cows were grazing on the Loch-side. The calves resulting therefrom were easily known from the shape of their horns.

An old Comrie Ferry story, formerly often told, may now be referred to. Sometime in the eighteenth century, a virulent epidemic or pestilence raged in the country. It was called in Gaelic "the great disease." The site of houses above Milton, which were burnt after it, may yet be pointed out. One of the monthly fairs was being held at Kenmore, and as no bridge spanned the Lyon at Comrie, people had to go either by ford or by ferry. A stranger asked to be ferried over. The ferry-man, thinking there was something mysterious and uncanny about him, and thinking, perhaps, he might not be a man at all but an apparition, was very polite and obliging, and said:—"When I meet a thorough gentleman like you, my conscience prevents me from taking the fare." When they parted, the strange visitant remarked, "I am 'the great disease'; to-day I will hang as a black cloud over Kenmore, but don't you be afraid, I will not harm you a bit, as you did not charge a halfpenny for ferrying me across the Lyon." If a spirit, it must have been an uncommonly poor one that couldn't get to the other side without the help of a ferry-boat; if a man, it was too bad of him to personate the pestilence for the sake of doing a poor Highlandman out of a halfpenny.

The belief in sacred stones may be alluded to owing to a sensational case here in the first quarter of last century. Different stones, historic and prehistoric alike, were considered sacred, and it was maintained they could not be removed with impunity. At the period referred to, three crosses stood at Dull, and the then factor, a Mr. Campbell, had two of them taken away. After acting as gate-posts at Camserney Cottage (estate office), they were afterwards transferred to the old kirk at Weem. The horse—belonging to a man of Dull—that removed the stones, became ill that very night, and died. Shortly after, the factor intended riding on horseback to Rannoch. While going up past Coshieville, he lost control over the horse—a bad one—which galloped down, and went right over the old bridge into Keltney Burn Den. Both rider and horse perished. This caused great talk throughout the country. The stones were blamed for it, or rather, the removal of these crosses was popularly believed to be the cause of the double catastrophe.

What with the smugglers and the fairs, the "ceilidhs," the "guisers," and the Old Days: the big weddings, the big funerals and the big communions: the crowded peat-mosses and the crowded harvest fields: the odd "characters," the two or three harmless insane persons, and two or three dozen other persons just slightly saner,—with all that, it can be readily understood that the district in days gone by was by no means the absolutely quiet place that it is on the day called to-day.

Changes in Church and School.

My father has witnessed the two greatest ecclesiastical and educational events of a century—the Disruption and the Education Act. He has seen four parish ministers, two parochial dominies, and then three schoolmasters, succeeded, owing to the small attendance, by a schoolmistress.

Church and school are now two distinct institutions, the church authorities, as such, not being allowed to have anything to do with the school. In my father's school-days it was different. The master was appointed by the Presbytery, and he was expected to act as precentor in the church, as an elder, and so on. "The minister's day" was the inspection day. The Act changed all that.

Gaelic was one of the subjects regularly taught, as it was also preached in church. The old parochials, local and Gaelic-speaking men, were, at or after the Act, superseded by English-speaking teachers, and Gaelic at first was not included in the Code. Hence, it has been asserted, its disappearance from school. That is true, in a way: but two points must be remembered. Firstly, in recent years educationists, influenced perhaps by the Celtic Revival, have gone in for "protection" of the old tongue, with what result remains to be seen. Secondly, Gaelic ceased to be preached in church quite as soon as it was given up in school, and over the preaching of the kirk, it need hardly be added, the educational authorities have no control whatever. One fact in regard to the language is that, if it has been losing ground here, it has been establishing itself elsewhere. Dr. James Robertson, referred to at the beginning of these notes, when here on a visit the year before his death, told us in a lecture that he was personally acquainted with places in Canada where nothing but Gaelic is spoken.

In the school curriculum history and geography received little attention, but arithmetic had more. A very few select scholars were taught elementary mathematics and Latin and Greek, but no science whatever.

The session was without a break. There were no holidays at Christmas, and Easter was a word unknown. The three months' summer vacation gave the boys an opportunity to help a little on the farms. The rule for closing was that as soon as a boy saw the first stook he was to go and tell the master. School dropped that very day. The modern educational authorities, the Boards, take no notice whatever of such matters.

The old school-room was in keeping with the times, damp and smoky and practically without a floor, badly lighted (with small windows), and heated by the peats brought by the scholars. There was no prophecy of a soup-kitchen. For dinner the scholar brought a dry "piece," usually half a barley bannock with a slice of cheese. Often most of it was stealthily eaten in school before dinner-time; this giving more leisure at the hour for playing and fighting.

Many old customs prevailed. On Handsel Monday every one had to give the master 6d. But the great affair of the school year, greater

even than the "minister's day," was cock-fighting day, when every boy paid the master 3d., and was expected to take a cock with him for the "war of the cocks" (as it was called in Gaelic). The whole district was ransacked by schoolboys for a special fighting breed, the gamecocks. Before my father left school, a stop was put to this. No one lamented the passing away of the great day more than the master. He lost many threepences over it.

The coming of the visitors—the fact that the Highlands are the (or at least a) playground of Britain—is a matter of great importance to us, in a way the most important, as the wealthiest class of them, the shooting gentry, are surely and not slowly buying up the bens and glens, and by all the present indications they bid fair to become possessors of more in future.

It may be noticed in a sentence—for the purpose of these jottings—that, notwithstanding Sir Walter Scott and Rob Roy and the Lady of the Lake, and so on, my father remembers when neither summer lodgers nor shooting tenants came this way, and when the present big hotels were mostly represented by old small inns, of the size of an ordinary farm-house. It was not till the coming of the Highland Railway that this part of the country was fairly opened up. Circumstances now compel us to think that possibly, nay probably, from such people may come our future landed proprietors and superiors. That opens up the whole question of the relations of landlord and tenant and all it implies. An era of transition is less or more an era of trial and anxiety. What the future has in store for us who knows? We live in hope. As our ancestors weathered the storm in days gone by, so we, as best we may, must do the same in the days that are yet to be.

ELDORADO.

THE "Empire of Guiana," which may be roughly described as the territory situated in the north of South America between the Orinoco and the Amazon, is probably one of the most unhealthy localities in the world, at least for Europeans. It emerges into the light of history about the year 1531, when Don Diego de Ordas, one of the Conquistadores companions of Cortes, led an expedition of the approved Spanish type against it. His objects were to obtain gold and to increase the area and resources of the already colossal empire of Spain. He was followed by several other Spanish adventurers, of whom Juan Gonsales and Antonio Sedenno were the most successful. Of the latter it is recorded that "he passed by Maracapana in the yeare 1536 to discover El Dorado with 500 chosen men. In his journey he got much gold, and tooke many Indian prisoners, whom he manacled in yrons; and many of them dyed as they were led in the way. The Tigers were fleshed on those dead carkeisses." Apparently cruelty and rapacity were the distinctive marks of all Spanish expeditions in the newly discovered continent, and they thus brought on themselves the bitter hatred of the native tribes and peoples wherever they went, and

they left a *damnosa hereditas* of distrust and suspicion to all their successors.

Guiana was then inhabited by Indian tribes, the principal being the warlike Caribs of whom Storm Van's Gravesande reports, "it is a very good thing to have them as allies or friends, for they render excellent services, but they are formidable enemies, capable of more bravery and resistance than one would think." There were, of course, numerous other tribes, all savage and some of them cannibals, of whom the most fanciful stories reached the ears of the European adventurers and were sincerely believed. Sir Walter Raleigh tells his friends Cecil and Howard that on the Caora river there are "a nation of people whose heads appeare not above their shoulders; which though it may be thought a meere fable, yet for mine own part I am resolved it is true, because every child in the provinces of Arromaia and Canuri affirms the same; they are called Ewaipanoma; they are reported to have their eyes in their shoulders, and their mouthes in the middle of their breasts, and that a long traine of haire groweth backward betweene their shoulders."

The tales of the Spaniards with regard to its wealth, corroborated by the analogy at least of the fabulous riches which had accrued to Spain from the conquest of Mexico and Peru, and possibly its defenceless condition, invested Guiana with an irresistible attraction for some of the adventurers of England. Some thirty years after that of Don Diego de Ordas, *i.e.* in 1562, Sir John Hawkins made the first of his three expeditions to Guiana, the inception and cause of which he thus naïvely and frankly tells us: "Master John Hawkins having made divers voyages to the Isles of the Canaries, and there by his good and upright dealing being growen in love and favor with the people, informed himselfe amongst them by diligent inquisition, of the state of the West Indies, whereof hee had received some knowlege by the instructions of his father, but increased the same by the advertisments and reports of that people. And being amongst other particulars assured, that Negros were very good marchandise in Hispaniola, and that store of Negros might easily bee had upon the coast of Guiana, resolved with himself to make triall thereof, and communicated that devise with his worshipfull friends of London." The conditions and results of these expeditions are set forth succinctly in the pages of Hakluyt, but apparently the accounts of them and others fired the ambition and emulation of the romantic Sir Walter Raleigh, second to none in fame or prowess of the gallant adventurers of the Elizabethan era. What he expected and hoped for may be gathered from his letter to his friends Cecil and Howard, and from his account of his somewhat unprofitable voyage in 1595. "Many yeeres since," he says, "I had knowlege by relation of that mighty, rich and beautiful Empier of Guiana, and of that great and golden Citie, which the Spaniards call El Dorado, and the naturals Manoa, which Citie was conquered, reedified and inlarged by a yonger sonne of Guainacapa, Emperour of Peru. . . . The country hath more quantity of gold by manifolde, than the best partes of the Indies or Peru. All the most of the kings of the borders are already become her Majesties vassals; and seeme to desire nothing more than her Majesties protection and the returne of the English nation. . . . The

Empire of Guiana is directly East from Peru towards the Sea and lieth under the Equinoctial line, and it hath more abundance of golde than any part of Peru, and as many or moe great Cities than even Peru had when it flourished most; it is governed by the same lawes, and the Emperour and people observe the same religion, and the same forme and policies in government as were used in Peru, not differing in any part; and I have been assured by such of the Spaniards as have seen Manoa the Imperial Citie of Guiana, which the Spaniards call El Dorado, that for the greatnesse, for the riches, and for the excellent seat, it far exceedeth any of the world, at least so much of the world as is known to the Spanish nation." He corroborates this account with quotations from the history of Francisco Lopez de Gomara.

Even the insignificant results of his own expedition did not dispel for Raleigh the glamour of Eldorado. He sets forth the attractions of the country with an eloquence and enthusiasm that a modern emigration agent might envy but not copy. "Those," he says, "that are desirous to discover and to see many nations, may be satisfied within this river (the Orinoco) which bringeth foorth so many armes and branches leading to severall countries and provinces, above 2000 miles East and West, and 800 miles South and North, and of these, the most eyther rich in golde, or in other marchandizes. The common souldier shall here fight for golde, and pay himself in steade of pence, with plates of half a foote broad, whereas he breaketh his bones in other warres for provant and penury. Those commanders and chieftaines that shoot at honor and abundance, shall find there more rich and beautifull cities, more temples adorned with golden images, more sepulchres filled with treasure, than either Cortez found in Mexico, or Pizarro in Peru; and the shining glory of this conquest will eclipse all those so farre extended beames of the Spanish nation. There is no country which yeeldeth more pleasure to the inhabitants, either for these common delights of hunting, hawking, fishing, fowling, or the rest, than Guiana does." If any other reasons were necessary for the occupation of Guiana, it was easily found in this, that it would checkmate and be a counterpoise to the still dreaded colossal empire of Spain. But events in England, *i.e.* a change of dynasty, ruled otherwise. Queen Elizabeth died in 1603. She was succeeded by a monarch who shivered at the sight of a drawn sword, and the conquest of Eldorado passed out of what we would now call the range of practical politics.

By the beginning of the seventeeth century, the fourth great competitor for the commerce of the world had appeared on the scene, *i.e.* the Dutch. It is not quite clear when Eldorado first attracted their notice; but a West India Company of the Netherlands was projected in 1607, and got its charter from the States-General in 1621. But before this latter date it seems certain that the Dutch had established a fort and settlement on an island in the river Essequibo. The somewhat misty story of the Dutch occupation of Guiana has been most carefully sifted and investigated in the latest publication of the Hakluyt Society, *The Rise of British Guiana*, by Storm Van's Gravesande. To this most interesting work the editors, Mr. Harris and Mr. de Villiers—the latter already

well known to our readers as editor of *The East and West Indian Mirror* (*S.G.M.*, vol. xxiii. page 501)—have contributed a thoughtful and comprehensive introduction, to which we are greatly indebted for the material of these remarks. Private traders, or as they were then called "interlopers," pushed their way up the Essequibo and established a considerable trade with the natives, to the great indignation and loss of the West India Company. But it is not surprising that from the very first the Dutch seem to have derived but little profit from their enterprise in Guiana, as in their methods of administration they took no heed of the requirements of the settlement, and the one and persistent demand from the home Company was for profits. Disgusted with the commercially poor results of the colony, the Company, in the middle of the seventeenth century, made it over to the three towns, Middleburg, Flushing, and Veere in Walcheren. The three towns made serious efforts at expansion and development, and succeeded in placing a second settlement on the Pomeroon; but this was practically destroyed by an English expedition from the Barbadoes in 1665. The settlement at Essequibo fared better, and a considerable trade was created in sugar, timber, etc. A second effort to plant a settlement at Pomeroon was made in 1686, but the settlement succumbed in 1689 to a joint attack of French and Caribs, and from that time the headquarters of Dutch influence in Guiana was Essequibo. In 1704 "the colony of Essequibo was centred round Fort Kijkoveral, which stood on an island where the Essequibo is joined by the Massaruni and Cuyuni; on the main banks of the river at the junction were some plantations of the Company's, and some others belonging to private individuals; cultivation was rather slowly spreading down the lower banks of the Essequibo towards the islands which stud its mouth. To the eastward there was practically no settlement, and the Demarara river was unopened. Westward the sphere of the Dutch extended along the coast to the mouth of the Orinoco, and in the interior also to the neighbourhood of that river: indeed, it may be said to have permeated the whole country between the Essequibo and the Orinoco."

For a vivid picture of Dutch administration, which the editors in one place justly describe as "parsimony and procrastination," we have to turn to the despatches of Storm van's Gravesande, who, in 1738, at the age of thirty-four, arrived at Essequibo, and served his ungrateful and short-sighted masters faithfully for thirty-four years. These despatches would, we are told, fill twenty-one volumes of three hundred pages each of bourgeois printing type; and they came into the possession of the British in 1814 when Essequibo and Demarara were finally ceded. They constitute a monument of Storm's patience, conscientiousness, assiduity and zeal. From them we learn what an uphill task he had in hand, and how little his labour and success were appreciated or rewarded by his masters, although they could not plead ignorance as an excuse. A soldier by training, the first thing he set himself to do was to improve the defences of the colony. He then proceeded with the work of investigation and development of the various resources of the country. "It may be said that the territorial consolidation of the Essequibo colony stands out prominently as the main feature of Storm's governorship, and in three

separate ways its story presents itself in his despatches: (i) in the definite steps taken to consolidate the possessions of the Dutch by a deliberate and thoughtful policy of development and exploration: (ii) in the policy pursued towards the various Indian tribes which Storm found in possession of the interior and coast; (iii) and—perhaps this is the most interesting of all—in the discussion as to the frontiers, and Storm's stout defence of the rights of the Netherlands against the Spaniards."

For the details we must refer our readers to the skilfully condensed introduction by the editors, and to the selections from the despatches themselves, which pourtray to us vividly the daily life of a brave, able, and devoted man in the midst of a sea of troubles. It is hardly to be credited, but it is true, that one of his oft-recurring troubles was want of food. Here is one example out of many of his remonstrances to "Your Highnesses" in Holland. "I cannot express to YY. HH. the difficulty in which I sometimes am. If it were for our households alone it would not matter so much, since we sometimes get assisted by one good friend or another, although I can assure YY. HH. with truth that I have often not a morsel of bread in the house, and that my children have even cried for a crust that I could not give them. . . . Had I not already for some time past dealt out half-rations of flour, we should have been for already eight or nine months, as we are now, that is without a morsel of bread. To-day is ration-day, and as I write this I have not a piece of bread nor a grain of flour, so that I am in the greatest difficulty and know not what I am to give the men." In a despatch dated fourteen years afterwards he refers to the "universal want," and adds that the colony was saved from starvation only by the English, who, in the same paragraph, he accuses of frequent piracies. For many years his pay was only £42 a year, raised after ten years' service to £67, a pittance on which he could not possibly support himself and his numerous family, but it appears he had a plantation, and received fees for certain of his duties. He told his masters he had to live like the meanest burgher, drinking no wine or spirits, and dressing below his station, and after twenty-four years' service he had to flee from his house as it was so dilapidated as to be dangerous, and take his family to another in which there were only two rooms, twenty feet square, and a vestibule. Quotations might be indefinitely multiplied showing the discomfort and sordidness of his surroundings up to the end, but in addition to this he became well aware that in the latter years of his service his masters in Holland were listening and giving credit to the malicious insinuations of his detractors and enemies. Advanced in years and impaired in health he found himself unable to cope with inefficiency and disaffection in the colony, and inattention and distrust in Holland. He had troubles with Indians and troubles with Spaniards, and the authorities at home frequently left him without soldiers or ammunition. Even the drugs sent to him were bad: and he was suspected of having embezzled tools and implements. He apologises for an indifferent map of the colony because he had no colours or pencils, "all that I had being entirely ruined by *black beetles*"! Notwithstanding such squalor and disheartening draw-

backs for the Governor the colony developed steadily. The number of plantations increased rapidly, and notwithstanding a great lack of labour in the shape of slaves, the trade in sugar, cocoa, cotton, etc., was considerable. At last pressure of work—he was at once Governor, secretary, bookkeeper, receiver of dues and taxes, and sales-master—broke down Storm's health, and he was compelled to insist that his oft-repeated offer of resignation should be accepted. He died in Demarara in 1775, having survived his demission of office only three years.

Storm Van's Gravesande had no Dutch successor who is worthy of being named along with him. Soon after his death the government of Demarara was separated from that of Essequibo. In 1781 war was declared between the British and the Dutch, and Demarara, Essequibo and Berbice were captured by the former; then they were wrested from the British by the French in 1782 and restored to the Dutch in 1783; recaptured by the British in 1796, restored to the Dutch in 1802, and finally passed into the hands of the British in 1803, their cession being ratified under the treaty of 1814. Of course during these troubled years the administration of the colony became thoroughly disorganised, and even under the British governors it was some time before order was re-established. "Certain minor constitutional changes which followed —the abandonment of cotton and increased cultivation of sugar—the troubles surrounding the final death of slavery—the struggles between the Legislature and Executive—for all these a word suffices, and we pause only at the 21st of July 1831, when Berbice was united with Demarara and Essequibo and the colony of British Guiana was constituted."

With regard to the exploration of what may be called the hinterland of the colony, Storm, however willing, had been able to do but little with the limited resources at his command. To the west he had established a fort, Aguigua, from which to command the Cuyuni river; he had established friendly relations with the Indian tribes on the Massaruni river, and traders had explored a considerable part of the Upper Essequibo. He made no attempt to define boundaries between the Dutch and the outposts of competing nations; apparently his policy was to keep the latter as far as possible away, to resist encroachments, and to conciliate the Indian tribes. Soon after the final cession of the territory, the British Government sent an expedition which explored the country between the Tukutu river and the Quitaro.

The year 1834, however, was marked by the first of Schomburgk's epoch-making expeditions. It originated with the Royal Geographical Society of London. "Schomburgk's reports and journals throughout the whole of his explorations form one of the most complete and interesting narratives with which the annals of geography have ever been enriched. He was a man with remarkable capacity for observation. He combined great natural genius as a surveyor with the eye of a botanist and the training of a naturalist. His references to the Indian tribes are full of a sympathetic intelligence which renders him, even at this date, one of the best chroniclers of Indian manners and customs." In 1835 he explored the Essequibo and part of the Rapununi; in 1836 he

explored the Corentin and Berbice; in 1837-8 he discovered the sources of the Essequibo and reached the Acarai mountains, which form the watershed between the Essequibo and the Amazon. His reports on the doings of Brazilian raiders induced the Home Government in 1839 to appoint him to be Boundary Commissioner of the British possessions in Guiana, and he carried out the work of delimitation between April 1841 and October 1843. The first part included the exploration of the Cuyuni from its source to Barima on the coast, and in the course of this he discovered Mount Roraima. The second part included the upper waters of the Essequibo, the watershed between it and the Amazon, and eastward to the sources of the Corentin, the course of which he followed to the sea. The country then entered upon a long spell of peace during which it made considerable progress. In 1857 rumours were started of the discovery of gold in the district of Caratal, some forty miles west of the Cuyuni river, and some mining expeditions were despatched which had but meagre success. In 1867 the British Government undertook a geological survey of the colony, which was entrusted to Sawkins and Brown. Mr. de Villiers says of their work that it "completed a service to geography which was in many ways worthy to rank with that of Schomburgk; and it may indeed be said that these surveys were complementary to that explorer's work. While they had reference to geology rather than to geography, they were of great interest even from the latter point of view." Expeditions were made later to the Pacaraima mountains with the object of ascending Mount Roraima, a feat which was first successfully accomplished in 1884 by Sir Everard im Thurn. It was found to be 8740 feet in height above sea-level.

In the early eighties the Venezuelan Government had begun to grant mining concessions to various people—American citizens among others—in what was undoubtedly British territory, and this led in 1887 to the issue of a proclamation declaring that the British claims to territory included everything that had ever been claimed by the Dutch, *i.e.* the basin of the Cuyuni and its tributaries. This was followed in course of time by the establishment of police stations in mining districts. The emissaries and agents of the Venezuelan Government however did not cease from their encroachments, and a crisis was precipitated in 1895, when Venezuelan soldiers crossed the Cuyuni and seized a British station at Uruan. It was promptly retaken. In the end of the year the headstrong President of the United States very nearly brought about war between Great Britain and the United States by an abrupt demand that the dispute between Venezuela and Great Britain should be submitted to arbitration. Had a Palmerston been in power in England war would have been inevitable. But Lord Salisbury, showing equal forbearance and judgment, accepted the proposal. After prolonged proceedings the arbitrators upheld the Schomburgk boundary with the exception of an insignificant tract in the north-west. The Brazilian Government on the south and south-west of the colony had been giving trouble with regard to the boundary in that direction, so in 1901 this dispute was also referred to arbitration, and settled in 1904

very much in accordance with Schomburgk's line. The boundaries of British Guiana have now been formally and finally demarcated in terms of these arbitration decrees, and since then the history of the colony has been uneventful.

The "great and mighty empire of Eldorado" has thus been under the sway of the British for a century, and its history during that period has not, on the whole, been chequered with any great revolution or catastrophe. Its resources and capacities are fairly well known, and its statistics are tabulated from year to year in the cold prosaic fashion which is distinctive of the Colonial Office. Its population is estimated at a little over 300,000 souls, of whom 24 per cent. are Portuguese, 16 per cent. are other Europeans, and the rest are East Indians, Chinese, Aborigines, Blacks, and mixed races. The revenue and expenditure each approximate half a million sterling. The imports and exports are each slightly less than two millions sterling. The bullion and coin exported amount to a little more than a quarter of a million. The output of gold from the mines amounts to only about 65,000 ounces; and it would appear that the prospects of both gold and diamond mining are far from rosy. The staple exports from the colony are sugar and its by-products. The rubber boom had but little effect on the colony, but the rubber industry may some day be successful, as a good deal of attention is being given to it. Malaria is the principal disease, as is to be expected in a country where an annual rainfall of 100 inches is not uncommon. These figures may suffice to indicate the condition of Eldorado to-day, that "large rich and beautiful empire" of which Sir Walter Raleigh, after seeing it and many other countries, said that "both for health, good ayre, pleasure, and riches I am resolved it cannot be equalled by any region either in the East or West."

THE VEGETATION OF AFRICA.[1]

An attempt to describe the vegetation of Africa may seem premature at the present time, since so much of the continent is unexplored or has rarely been traversed by the botanist. On the other hand, considerable tracts in and adjoining European possessions are fairly well known, and what is known of these places the author proposes to piece together. There can be no doubt that, as regards the German colonies, this work marks a great step forward, and if the British lands receive less attention, it is probably because exploration in and around them has been political and commercial rather than scientific. It is noteworthy that the value of this volume of over 1000 pages has been greatly enhanced by 400 figures, and a number of plates and maps, the funds for which were provided by the Colonial Office at Berlin.

This volume takes the form of a general survey, especially of the tropical vegetation of Africa, and is introductory to four other volumes

[1] *Die Pflanzenwelt Afrikas* (vol. i.), by A. Engler (*Die Vegetation der Erde*, Part ix.). Engelmann, Leipzig. 1910. Price 60 m.

dealing mainly with floristic and systematic details—one of these has already been noticed.[1] The general orientation is of considerable length (pp. 1-866), and takes up in succession the different countries, particularly the coastal ones. The translation of Schimper's *Plant-Geography* has already made available to the English reader the general features of the more accessible parts of Africa; this work of Engler's is, however, much more detailed, hence on the whole adapted rather to the specialist than to the general reader. Within the limits of a short notice little can be done except to indicate the scope of the work.

The main features of the vegetation of Spain and other countries on the European side of the Mediterranean are found again in North Africa, better developed, however, because cultivation and settlement of the land have not proceeded so far. From Morocco and the cultivated "Tell" lands of Algeria, the reader is taken over the "alfa-grass" of the inland plateau to the slopes and summits of the Atlas Mountains, and into the Sahara, which is by no means so monotonous in its vegetation as is generally supposed. Eastwards, the better-known lands of Egypt and the Nile, Abyssinia and Somaliland are dealt with. From the Galla Highlands and the Masai Highlands, British East Africa is reached, and although this receives a shorter notice than might be desired, the deficiency can be made up from works of British explorers. German East Africa receives more attention (120 pp.), and the provision of a coloured vegetation map enables the reader to follow the somewhat intricate zonation from the sea-coast to the higher mountains. The coast is mainly a white strand with xerophytic plants, backed by a green bush-scrub broken by plantations of coconut and mango. The creeks and estuaries with oozy mud are distinguished by the mangrove swamp. The coastal bush-forest is rich and evergreen, a reflex of the heavy tropical rainfall during the long rainy season of the south-west monsoon and the lesser rains in October and November. Behind this coastal screen of forest the rainy season becomes shorter, and the great steppes and scrubs of the interior begin. The rich fauna is probably more familiar than the somewhat meagre flora, but Dr. Engler has prepared the way for that economic development of East Africa which is to come, by a classification of the various forms of steppe met with. The more arid are salt-steppes, and those with fleshy, thorny succulents: less dry are the thorn-bush steppes consisting either of evergreen or deciduous scrub. Other forms of steppe are "park-like" with trees standing isolated over a poor ground-vegetation on the drier soils, or over a grassy sward in moister conditions. The tropical rain-forest, which in West Africa begins near the coast and follows rivers like the Congo far inland, is in East Africa limited to the tropical valleys of the larger mountain regions such as Usambara and Kilimanjaro. On the mountains the chief zones are bush-scrub or grass-land above the rain-forest, then a "cloud-forest" which follows the occurrence at higher altitudes of a zone of low night-temperatures with much cloud. The summit zones are alpine in character, with giant Senecio and Lobelia in the lower subalpine.

[1] *Scott. Geog. Mag.*, March 1909, pp. 144-6.

The next groups of countries dealt with are those round Tanganyika and Nyassa, and eastwards to the coast, then Rhodesia and South Africa. The arid character of German South-West Africa is shown by a vegetation map, and other coloured maps bring out in strong contrast the rich forest areas of the Kamerun and Togo. The description of the West Coast is completed by a short sketch on the vegetation of the islands, Cape Verde, the Canaries, and Madeira.

The geographical part of the work (pp. 871-966) gives details of temperature and rainfall in the different regions of Africa, and short summaries of the altitudinal zones, and of the ecological plant formations. For floristic purposes, the continent is divided into four areas: (*a*) the Mediterranean, (*b*) the deserts of the northern African-Indian area, (*c*) the forest and steppe area, and (*d*) the south-western Cape area.

While a work of this size requires some application in reading it, the wealth of illustration is of great assistance. Most of the figures are purely botanical, illustrating the features of characteristic species, but there is also a large proportion of landscapes or habitat illustrations, reproduced from photographs.

GEOGRAPHICAL NOTES.

Polar.

Argentine Antarctic Station.—Mr. R. C. Mossman sends us the following note about the work of this station :—

"The annual relief of the observers located at Laurie Island, South Orkneys, was effected early in February by the *Uruguay*, which experienced very heavy weather both on the outward and homeward voyage. The observers report a very open autumn and winter as having occurred last year—May, June, and July being all milder than any noted previously. The first zero temperature was not observed till July 24, or three months later than in 1903, when the *Scotia* was frozen in by the end of March. In 1910 Scotia Bay remained unfrozen till the last week of July, being the latest date observed, and broke up on November 18. August was a cold month. During the summer of 1910-11 there was much pack ice round the islands, which did not disperse till early in February, a few days before the arrival of the relief ship.

"Mr. Elliston, a Norwegian, one of the meteorological observers, died on August 20 of a cardiac complaint after a few weeks' illness."

Amundsen's Antarctic Expedition.—On p. 264 we spoke here of the finding of the *Fram* in the Bay of Whales, by the party on the *Terra Nova*, and of the announcement that Captain Amundsen had so far changed his plans as to be about to attempt an attack on the South Pole. In a recent issue of the *Times* there appears a letter from Captain Amundsen, dated Feb. 9, 1911, and presumably brought back to civilisation by the *Fram*. This letter gives a considerable amount of detail in regard to the journey southward from Funchal, where the change of plan

was first laid before the other members of the expedition, to the Bay of Whales, but it still leaves the explorer's future plans in some obscurity.

Some difficulty was experienced in bringing the 115 dogs safely through the tropics, but this was ultimately accomplished by unremitting care. The *Fram* proved to be extremely seaworthy, and the journey from Funchal to the ice was made without a stop, and apparently without incident. The first ice was sighted on Jan. 1, 1911, and the Antarctic Circle was crossed on the 2nd, when a broad band of drift ice was encountered. It took four days and nights to get through this, and then the open Ross Sea was reached in lat. 70° S. and long. 180° W. in fine weather. Henceforth, till the Barrier was reached in lat. 78° S., no more ice was seen with the exception of two small bergs. The Ice Barrier was sighted on Jan. 11, but not till the 13th was the Bay of Whales entered. A landing was effected a day later, practically on the date that had been planned. An excellent site for winter quarters was found about 1½ miles from the ship, in long. 164° W. and lat. 78° 40′ S., and here a solidly-built house was set up, surrounded by 15 tents, the whole being accomplished in a period of three weeks. During this period the party lived almost entirely upon seal meat, and expected to be able to preserve enough for themselves and their dogs during the winter. Captain Amundsen says that it was his intention, at the time of writing, to lay down a main depôt at 80° S., and a minor one at 83° S. This task he hoped to accomplish by the beginning of the southern autumn, but there is nothing in his letter to indicate that he intended to make a winter attempt on the Pole, as was suggested by the verbal message brought by the *Fram*.

Dr. Mawson's Antarctic Expedition.—On p. 264 we mentioned Dr. Mawson's lecture to the Royal Geographical Society on his proposed Antarctic expedition. This lecture is published in the June issue of the *Geographical Journal*, and is illustrated by two maps, suggesting two views of the probable form of the Antarctic continent. The view Dr. Mawson favours is that which supposes that the Continent forms one land mass, as opposed to the other view which holds that an arm of the sea runs from the Ross to the Weddell Seas, thus separating the continent into two land masses (cf. vol. xxvi., p. 263). The larger map, which represents the first view, shows a land mass with an area of some 5,000,000 square miles, which in form recalls an inverted South America, the broad end being towards Australia and the narrow towards Cape Horn. The Andes are supposed to be continued along the Pacific margin of this land mass, and to stretch from Graham Land to Cape Adare, reaching heights of 15,000 ft. The very fine photographs shown by Dr. Charcot at his lecture during the past winter would, on this view, represent the seaward margin of this Andean chain. From this great chain there extends towards the Indian and Atlantic Oceans a great plateau, with a probable average height of 6000-10,000 ft. From the steep Pacific margin of the chain there extends towards that ocean a vast tract of Barrier ice, with possibly islands or undulating land. Edward VII. Land is perhaps such an island. The Indian Ocean and Atlantic slope is

more gentle. It is perhaps fringed with Barrier ice, and in that case Enderby Land and Kemp Land would be only islands. Dr. Mawson's expedition, if carried out, would lead to an investigation of the shore line of the continent from Cape Adare to the Gaussberg, or further west, a distance of over 2000 miles, and would at least help to solve some of the problems connected with the form of the continent.

Commercial Geography.

The Commerce of Japan.—The problems presented by the rapid development of the foreign commerce of Japan offer many points of interest to the geographer, and these problems are worth study from many points of view. Among the official *Rapports Commerciaux* of France, a series of reports is now being issued on the subject, considered especially in its relation to France and French commerce. From one of these reports, that dealing with the demand in Japan for all the various articles of clothing, and of the materials used in their manufacture, we take the following account. The author emphasises certain general points in regard to Japanese commerce, notably the fact, which has been emphasised by other observers, that the recent great increase in manufacture has been due to the unrestricted use of unorganised female and child labour. So much is this the case that governmental efforts to regulate labour have been frustrated by the outcry of the manufacturers, who assert that regulation would destroy the nascent industry of Japan. The experience of other manufacturing nations, however, is that the reckless exploitation of child and female labour is a pawning of to-morrow which involves great risks to national well-being.

Again, a remarkable feature of Japanese industry is that the product is not intended for the home market. From the beginning of the recent development the Japanese manufacturers have aimed and are aiming at a foreign market. As the available skill, organisation, machinery, and so forth does not permit serious competition in the markets of the civilised world, the markets aimed at are, at least to a considerable extent, regions where modern industry has as yet no hold. The nearest such market is, of course, China, but this fact brings with it a grave risk. The rise of manufactures in China, a boycott of Japanese goods, economic disturbances, or other causes may, at any time, close this market with results which might be very serious to Japan.

Another curious point also emerges from the French Consular Report. Apparently the Japanese exclusiveness of old days is reviving in a new form. At least it would appear that the Japanese are making tremendous efforts to concentrate both import and export trade in Japanese hands, and so shut out foreign intermediaries of all kinds. To do this they are stated not to hesitate to sell goods under market price, and thus to disturb the market. This policy is producing great perturbation among the French merchants who have hitherto bought Japanese silk for European markets.

As to the individual textiles and materials, silk is by far the most important, accounting for nearly 40 per cent. of the total exports.

Indeed, silk is by far the most important product of Japan; it is the substance upon which she must depend for her purchasing power. The manufacture of silk is, of course, very old, as is also the rearing of the silkworms and the spinning of the silk. But the very universality with which the rearing and spinning are carried on is now a handicap, for it means that the product is far from uniform, and the great importance of silk textiles in earlier days meant that national energies were devoted rather to producing quantity than quality. The government are now making great efforts to improve the quality of the silk, and to render the breeds of the moth more uniform. Efforts are also being made to promote silk-weaving in Japan, but meantime some three-quarters of the silk exports consist of raw silk. Formerly all the silk waste was also exported, but the Japanese are beginning to set up factories for the utilisation of this. The export of silk textiles has been greatly checked by the varying quality of the product, and the frequency of slovenly and fraudulent workmanship.

With the opening of Japan to commerce, cotton fabrics, previously little known or used, became popular. Factories were then established to supply the home market, which speedily became too small for the output. The raw material is not produced in Japan at all, save in amount to satisfy a small and primitive domestic manufacture. The factories seek their supplies abroad, especially in British India, but the Japanese are striving more and more to make Korea a cotton-producing country, and also to lay down large cotton plantations in Siam. In addition to China and the adjacent countries, British India yields a good market for the products of manufacture.

Wool, like cotton, is not produced in Japan, but attempts are now being made to develop its manufacture. The raw material is purchased, especially from Australia, but the costliness of the machinery necessary in the finer branches of wool-weaving results in the fact that the home product is somewhat inferior in quality and does not supply the home demand, especially for the finer goods. The widespread adoption of European dress, including leather shoes, all varieties of European hats, gloves, etc., are introducing some curious changes in Japanese commerce, but these space does not permit us to treat of here.

EDUCATIONAL.

A LARGE scale model of the Island of Bute has for some time been on exhibition at the Society's rooms in Edinburgh, and may be recommended to the notice of teachers as illustrating some interesting points in connection with the geography of Scotland. The model, which has been kindly lent by Messrs. W. and A. K. Johnston, the makers, is on the scale of six inches to one mile, the vertical scale being three times the horizontal. The covering of vegetation is indicated by the colours employed. Thus heather moors are coloured purple, woods dark green, and pastures and cultivated lands bright green. The towns and villages are shown in red, and on the beach shades of yellow are used to differentiate between sand and shingle.

The island, it will be recollected, like Arran, lies partly in the Highlands and partly in the Lowlands. The junction is indicated by an oblique band of low ground, stretching across the island from behind the town of Rothesay to Scalpsie Bay, and having the elongated Loch Fad and Loch Quien lying in depressions. From the northern side of this depressed area such hills as Blackpark, Barmore, and Quien arise, which, though of very moderate height, are of interest because they suggest, in miniature, that line of hills which elsewhere rises to the north of the Great Fault, and indicates the margin of the Highland area.

The more rugged portion of the island lies to the north of this miniature dividing line, but not all the land to the north is rugged. From Kames Bay to Ettrick Bay, as the model shows well, there runs an area of low ground, with smooth contours. As a geological map indicates, this line corresponds to a band of clay-slate, which, after crossing Bute, skirts the Firth of Clyde near Innellan and Dunoon, crosses Loch Long and the Gareloch, and then stretches across Lochs Lomond, Ard and Vennachar to the Pass of Leny. As explained by Sir Archibald Geikie in his *Scenery of Scotland*, this band is throughout its length indicated by the smooth undulating form of the ground. In the Highland part of Bute the Highland schists appear both to the north and south of this band of low ground, and in both regions their presence is indicated by the rugged, heather-clad nature of the surface.

To the south of the "Highland line" in Bute, we have the Old Red Sandstone beds, which also occur in the Cumbrae and on the adjacent part of the mainland. These beds produce a less elevated and less rugged type of scenery, except to the extreme south, where the appearance of andesitic lavas gives rise to the peculiar terraced hills which are so frequent in this region of the Clyde. Thus on a very small scale many features of the scenery and structure of Scotland are shown on this model. We have the contrast between the sedimentary rocks of the Lowlands and the metamorphic rocks of the Highlands, the latter rising as hills to the north of the junction line of the two regions. Within the Highland area we have an example of the way in which the rocks affect scenery in the contrast between the scenery of regions of schist and those of clay slate. Then in the Lowland region we have an example of the fact that the presence of igneous rocks may give rise to well-marked hills, thus suggesting the conditions so familiar in the Lowland Plain elsewhere.

Another point which is well illustrated by the model is the presence of the raised beach, well shown near Port Bannatyne, where the old sea-cliff rises up behind the narrow coastal plain on which the village stands. It is a familiar fact that towns and villages in the Clyde area are usually placed on the coastal plain, which is here a raised beach, so that in this respect also Bute is typical of a larger area. These are only some of the points which can be made out from a study of the model, which is well worth careful attention.

We have received a second series of Philip's *Geographical Pictures*, published under the editorship of Mr. P. H. L'Estrange. Full details of

the previous series will be found in vol. xxv. pp. 328-9. The present series is divided into four sets:—(1) Historical, including Stonehenge as a prehistoric monument, and St. Botoloph's Priory, Colchester, and Pevensey to illustrate Roman and Norman remains; (2) Industries, illustrated by a series of plates representing iron works, shipbuilding works, and so forth; (3) Famous scenery, including two fine views of the English lakes; (4) Famous cities, with views of Edinburgh, Newcastle-on-Tyne, Oxford, etc. The plates show the same features as those of the previous series, and in their general get-up and style are very successful, and to be recommended to the notice of teachers. But to our mind the choice of the particular subjects represented is in some instances open to criticism. Thus if only three plates were to be devoted to historic monuments, it seems a pity that two should be devoted to Norman buildings. Saxon remains are surely not very infrequent. Similarly in the industries the very important cotton industry is unrepresented, no less than the woollen, while two plates are devoted to fishing boats. The subjects of the present series are perhaps more difficult to illustrate than the land forms, etc., of the previous one, but the choice of illustrations certainly seems less happy.

NEW BOOKS.

EUROPE.

The Making of Scotland. By the Right Hon. Sir Herbert Maxwell, Bart., F.R.S., LL.D., D.C.L., Pres. Soc. Ant., Scot. Glasgow: James MacLehose and Sons, Publishers to the University, 1911. *Price 5s. net.*

It is, we believe, quite superfluous to recommend these lectures to the perusal of the vast majority of our readers, for their subject, the early history of Scotland, must appeal to them with irresistible force. And yet it is to be feared, that a great majority of Scotsmen have but a hazy idea of the complicated events, which led up to, and followed, the great War of Independence, with which the name of King Robert Bruce is inseparably connected. They should be grateful, then, to Sir Herbert Maxwell, who has carefully investigated and sifted the conflicting chronicles and ancient records, and in the short compass of a couple of hundred pages has provided for them an impartial and trustworthy narrative of the history of these troubled and strenuous years. Impartiality and fidelity to truth are perhaps the most obvious features of Sir Herbert's work as a historian, and the reader, however patriotic and romantic, must be prepared to accept some uncomfortable truths regarding our national heroes. Of the literary merit of the work we need only say that it is quite worthy of Sir Herbert Maxwell, and of the place where the lectures were delivered.

The Roman Wall in Scotland. By George Macdonald, M.A., LL.D. With Map, Plans, and Numerous Plates. Glasgow: James MacLehose and Sons, 1911. *Price 14s. net.*

The Antonine Wall has obtained its own monument in this volume which gathers into one the history, the latest theories, and the description of this famous relic of Imperial Rome. It is satisfactory in the earlier portion of the volume,

which concerns the written and other records, to have put before us the *ipsissima verba* of the authorities referred to, all the more so that these enable us to appreciate the fairness and the soundness of Dr. Macdonald's deductions. We must also agree in according, as he does, greater weight to the evidence of monuments erected on the spot, and coins, some of which have come to light but a few years ago, than to the *obiter dicta* of ancient authors writing maybe at a considerable distance of time or of space. In no previous history of the wall have coins been made to yield so many points of light.

So far as known to-day the history and physical features of the wall were as follows. In the year 81 A.D. the Emperor Agricola built a number of small earthen forts between the Forth and Clyde, but these were very soon abandoned. The wall proper was constructed largely on the same line under Antoninus Pius by his legate, Lollius Urbicus, *c.* 142 A.D., and was held for some forty years. But this period was not unbroken, for between the years 155 and 158 a successful revolt swept back the defenders and once later a temporary abandonment seems to have occurred. It must be remembered, however, that the wall existed more for police purposes than for continuous defence, which would have required too large a force. It was of service in signalling, and at its extremities protected the landing of military stores from the ships.

The line of the wall shows greater judgment than does the English Wall. Its foundation consisted of kerb-stones some 14 feet apart, between which rough stones were thrown in, and above this was raised a wall of sods to a height probably of 10 feet. On this there may have been a palisade. In front was a "V" shaped ditch averging 40 feet in width by 12 in depth, beyond which the excavated earth was carefully disposed to form the northern *agger*. To the south of the wall ran the military way which in places is in regular use to-day. Forts were erected at irregular intervals, and in front of one of these—Rough Castle—there is a unique series of defensive pits called by the Romans *lilia*.

On many questions which still remain unanswered certainty can only be achieved by excavation. But Dr. Macdonald's erudition and ingenuity, and the full use he has made of recent investigations constitute this book a great advance upon all previous authorities. His treatises on cognate subjects, such as the Roman army, appeal both to the popular reader, even the schoolboy, and to the expert. It is interesting to note here the established Roman practice by which the live spoil of a campaign was deported to some distant part of the Empire ; so that it is in Central Europe that we find *cohortes Britannicæ* serving under the eagles of Rome, while the wall was held by natives of Germany, Thrace, Spain, etc. One curious detail is the sudden disappearance of a Spanish legion, caused, it is conjectured, by its annihilation in some successful inrush of the northern tribesmen. The excellent illustrations add to the attractions of the volume.

Scrambles in Storm and Sunshine among the Swiss and English Alps. With 4 Illustrations by R. C. Armour, and 28 Photographs by the Author. By E. Elliot Stock. London : John Ousely, Ltd., 1911. *Price 6s. net.*

This is a volume which will awaken very pleasant memories in those who climb, or have climbed in the Alps, or on the classic crags of Wastdale. It is difficult to write anything new about the Alps. All the peaks have been surmounted, many of them by all possible, and, we might say, impossible routes. The various climbs in the Lake District have been mapped out so accurately that, according to scoffers, if you step off with the wrong foot you have soon to come down and begin all over again. The experiences which Mr. Stock has selected for description were mostly

unfortunate. The principal cause was bad weather, and that was due chiefly to the fact that the climbs were made very early in the season. June is the best month for enjoying the floral beauties of the Alps, but not for ascending high mountains. It is rather irritating to meet, time and again, the words arête and sérac spelt with two r's, an error for which there is no justification whatever. Also the hut referred to on Monte Rosa is usually spelt Bétemps, not Beautemps. The two chapters on Wastdale district are slight but entertaining, and the book is well illustrated.

The Rhine, including the Black Forest and the Vosges. Handbook for Travellers. By Karl Baedeker. Seventeenth Revised Edition. Leipzig: Karl Baedeker, 1911. *Price* 8*s. net.*

Baedeker's *Rhine* has the historical interest that its first edition, published in German in 1828, inaugurated the long series of guides which have been the friends of successive generations of travellers since. As in the case of other recent issues, the present volume is so arranged that it can be cut up into sections, to avoid the necessity for carrying about the whole volume. The present issue corresponds to the thirty-first German edition, and has been revised up to date.

The Danube with Pen and Pencil. By Captain B. Granville Baker. London: Swan Sonnenschein and Co., Limited. New York: The Macmillan Company, 1911. *Price* 15*s.*

Captain Granville Baker is already well known as the author of an acceptable work on the *Walls of Constantinople*. In this book he takes the Danube as his subject-matter, and beginning at its source in Donaueschingen, in the Grand Duchy of Baden, he traces its course to the Black Sea. This gives him the opportunity, of which he takes full advantage, to recall to his readers the wealth of legendary and historical romance clinging to the territories through which the Danube flows. It is inseparably connected with the principal events of European history, such as the terrible invasions of the Goths and Huns, the campaigns of the Frankish emperors, the wars of the Reformation and of the Spanish Succession, the Turkish invasions, and the victories of Napoleon. It has to be confessed that often his style is somewhat stilted and artificial, but on the whole Captain Baker tells his story well. He has made himself fairly well acquainted with the historical literature connected with it, and he writes with the enthusiasm of an artist. Many of the numerous illustrations are of exceptional merit.

Finland To-Day. By George Renwick, F.R.G.S. London: T. Fisher Unwin, 1911. *Price* 10*s.* 6*d. net.*

Among the many multiform and complex problems which perplex the Government of Russia at this time, there is none more serious and perplexing than that of the future Government of the Grand Duchy of Finland. The country itself is of comparatively little value. It has, it is true, immense forests and some fine granite quarries, but as its internal communications are very defective, the export of timber and other forest produce and granite is small—hardly amounting to £10,000,000 in value per annum. There are practically no mountains, and some ten per cent. of the area is under water. The arable land is very limited, and the population only about twenty to the square mile, and even this is rapidly decreasing by emigration owing to the resentment of the inhabitants at the oppression of the Russian Government and officials. The falling off in the population is a serious matter for the Russian Government, because it is from Finland that it derives its

supply of sailors. In this volume Mr. Renwick, who is favourably known as the author of *Romantic Corsica* (*Scottish Geographical Magazine*, vol. xxvi. p. 210), describes his impressions of the Grand Duchy formed during two visits in 1906 and 1909. He visited many of the important towns, and had some exciting journeys by water. Evidently he established most friendly relations between himself and the inhabitants with whom he came in contact, and he gives us vivid and instructive descriptions of their daily life, houses, manners, and customs. He has also some valuable chapters on literature, music, art, and sport. He does not attempt to disguise his condemnation of the late developments of the Russian Government, which are obviously aimed at the abolition of the practical independence of Finland, which was solemnly guaranteed by Alexander I. at Borga in 1809, but this is a political question which is outside of the scope of this magazine. This much, however, may be said, that the sympathies of the citizens of every free country must be with the Finns, a "serious, patriotic, and hard-working" people, who have done nothing to deserve the hard fate from which there seems no way of escape.

Europe (*Blackie's Causal Geographies Regionally Treated*). By H. J. Snape, M.A. London: Blackie and Son, 1911. *Price* 2*s*.

This is to be the first of a series of three volumes, the other two treating respectively of Asia and North America, and South America, Africa, and Australasia. It is illustrated by some good sketch-maps and diagrams as well as some coloured maps. There is nothing specially novel in the mode of treatment, but so far as we have tested the book there seems reasonable accuracy in regard to detail, and it will doubtless fill a place in the teaching of geography.

ASIA.

The Nāga Tribes of Manipur. By T. C. Hodson. Published under the authority of the Government of Eastern Bengal and Assam. London: Macmillan and Co., Limited, 1911. *Price* 8*s*. 6*d*. *net*.

In this book we have an interesting study from the ethnographical and anthropological points of view of a small group of tribes, which inhabit the northern half of the native state of Manipur, situated between Upper Burmah and Assam. In customs and habits these tribes have many features in common with the savage Abors to the north, who are responsible for the recent massacre of Mr. Williamson and his party on the borders of Assam. The notes from which the book is compiled were collected, we are told, some ten years ago, and are replete with details regarding the origin, dress, domestic life, laws, customs, and religion of the tribes concerned. The information was procured by Mr. Hodson on the spot, and is exceedingly interesting as an accurate and valuable record of a phase of society, which must necessarily disappear in the course of time as the result of the Pax Britannica and advancing civilisation. The book is worthy of a place alongside the well-known classical works of Risley, Grierson, Crook, etc.

Half-a-Century in China; Recollections and Observations. By the Venerable Arthur Evans Moule, B.D. London: Hodder and Stoughton, 1911. *Price* 7*s*. 6d. *net*.

Books on China have recently issued from the press, if not *ad nauseam*, at any rate *ad satietatem*, but a residence in the country extending over fifty years enables Archdeacon Moule to speak with the authority born of long experience, and he has much to tell which is of genuine interest. Arriving in China in 1861,

when the country was in the throes of the great Taiping Rebellion, Archdeacon Moule is one of the very few surviving witnesses of the siege and capture of the city of Ningpo by the rebels, and of its recapture later by Captain Roderick Dew with the small force of British bluejackets and marines under his command. The double siege was one of the incidents in a topsy-turvy war during which the British were engaged in fighting the Imperialists in and around Peking, and lending them aid to subdue the rebels in mid-China, at one and the same time. The story of the operations is told by the author in a picturesque, if fragmentary, fashion, the narrative being based upon his notes of his own experience at the time.

Archdeacon Moule devotes the first portion of his book to a résumé of events attending the Taiping Rebellion which swept over a large part of China between 1852 and 1864, and, before it was subdued, cost countless millions of lives and caused untold suffering. In *Shanghai, Past and Present* we find discussed "the reasons, geographical, political, and commercial, which have combined to transform this place, formerly somewhat obscure, difficult of access, and unimportant, into the very centre and throbbing heart of the trade and enterprise of mid- and north-China, and of the Farther East"; from a bare mud flat to one of the busiest commercial cities of the world.

In speaking of the change which is coming over China, and the new-born desire of the people for western ways and western knowledge, Archdeacon Moule appeals for a system of education which will retain their own classics, while incorporating with them the study of modern science; and he pleads with patriotic Chinese and their sympathisers not to allow changing China to change so hurriedly and radically as to lose what has been useful and noble in her past. The author has a belief in China which, to many who only have eyes for what is effete and corrupt in her mode of government, must appear almost pathetic; but we can confidently recommend his book to the notice of our readers as a real contribution to the study of the problems of the Far East.

AMERICA.

An Unknown People in an Unknown Land: An Account of the Life and Customs of the Lengua Indians of the Paraguayan Chaco, with Adventures and Experiences met with during Twenty Years' Pioneering and Exploring amongst them. By W. Barbrooke Grubb. Edited by H. T. Morrey Jones, M.A. (Oxon.). With 60 Illustrations and a Map. London: Seeley and Co., Ltd., 1911. *Price* 16*s. net.*

This book makes a wide appeal, to the missionary enthusiast, to the anthropologist, the geographer, the lover of adventure, and the trader.

The Gran Chaco is a plain of some 200,000 square miles in the heart of South America. It contains much forest, but is largely an alternation between desert and swamp according to the season. Chaco may be translated Chase in the sense both of a hunting-ground and of flight and pursuit. The latter meaning seems to date back four or five centuries to the time when the inhabitants of Peru fled before the all-conquering Spaniard. The evidences of such origin are numerous. It is shown in the greater intelligence and finer features of the tribes in that direction, in the patterns of their woven stuffs, in their worship of the Pleiades, in their conception of the home of their departed as cities of regular plan, such as none of these nomads can ever have seen, in the burial of their dead facing westwards, and in their tradition of buried treasure. To Mr. Grubb alone of white men has the story been confided of a gallery hand-hewn in the rocks—and this is from a people who know neither pebble nor stone in their own land—which penetrates some

distance into the hillside, and in which some valuable treasure lies hidden. Within living memory, they say, some Indians penetrated to that region and three entered the secret place but never returned.

Twenty years ago the condition of these people was gross. They were pursued by the fear of ghosts. Whenever a death in a camp occurred they immediately removed from dread that for a month or more the spirit of the departed would haunt the spot. They believed implicitly in dreams, and were wholly under the influence of their witch-doctors. A curious rain-making ceremony of the latter was the sprinkling of the blood of a certain duck towards heaven. The performance was not so meaningless as appears at first sight, for this species of duck was only found in the neighbourhood when it was flooded, that showed that the rivers were full and that again indicated rain in the higher waters which would probably arrive shortly. The burial rites of the people were of the savagest, for they would drive a stake through the body, or mutilate it, according to the supposed nature of the illness, and as they did not distinguish too carefully between a swoon and death, the possibilities were very terrible. They held the beetle theory of creation.

It was to such a people that the Church of England South American Missionary Society despatched Mr. Grubb, then aged twenty-three. For many years he carried his life in his hands. It was due to his wise masterfulness that he escaped on his first entry into the country, and later also to the insight he had acquired into the workings of the tortuous but acute native mind. After attending a funeral he was once in critical danger because an old woman's dream led the tribe to believe that he had been juggling with the ghost. Another time a plot was laid to murder him, and huts were to be built as halting-places for his spirit to induce it to leave the country. Most serious of all he was shot in the back by a treacherous attendant, and for days was on the verge of death. But this dastardly attack was followed by the formal execution of the culprit by his own tribesmen,—the first time a penalty had thus been exacted for an attack upon a white man,—and afterwards by the happiest results to the mission. Writing of to-day Mr. Grubb says, "Where formerly it was dangerous for a white man to go without an armed party, any one can now wander alone and unarmed, so far as any risk from the Indians may be apprehended, over a district rather larger than Ireland. In a country where fifteen years ago there were no tracks other than Indian footpaths resembling sheep-tracks at home, now about four hundred and fifty miles of cart-track have been made in order that the mission bullock-carts might readily traverse the country. Where formerly tribal war was common, peace has reigned for many years over a district as large as Ireland and Scotland combined."

One of the most powerful levers in the elevation of the Indian, morally as well as materially, has been the overthrow of his socialistic system. Formerly the cultivator who could easily have produced a treble crop would refuse to do what would be no benefit to his family. Hunters coming upon a quantity of ostrich eggs would gorge themselves with the find rather than burden themselves for the benefit of village loafers. The miserable shelters, the frequent starvation of the people, were due to the same cause. But Mr. Grubb is able to point now to a settled community of three hundred persons working their separate allotments, owning their separate flocks, and possessing an aggregate wealth formerly undreamt of. They even gathered a contribution towards the Indian Famine Fund.

Such indeed has been the success of Mr. Grubb's work that he has opened a fresh market for outside trade, largely British, and that the Paraguayan Government, recognising his authority, have for eighteen years officially recognised the mission as their representatives among the Indians and have granted all necessary powers.

Among the matters of interest in the appendices reference may be made to the lung-fish, which lives as a fish when the swamps are full, and in the dry season burrows into the mud, leaving only a small breathing-hole. When eggs have been laid the male fish, often three feet in length and bulky, lies on guard in the burrow, and it is no pleasure to encounter his sharp teeth.

The book is in every view a remarkable one, full of incident, and losing nothing in interest by reason of the simplicity with which the story is told. Among the outside testimonies quoted are letters from Mr. Herbert Gibson and Mr. Livingstone Learmonth. The latter says, "I may say that I have seen missions in many parts of the world, including those to the North American Indians and that of the Danes to the Esquimaux on the west coast of Greenland, which I may take as fair samples of rough work; yet I do not hesitate to say that as a record of hard, patient, rough, enduring work, this Mission to the Chaco Indians has only been equalled by that of the Jesuit Fathers when they made their noble effort to Christianise Paraguay. It must, however, be remembered that even the Jesuits tried to evangelise the Chaco, but gave it up, as the obstacles were so enormous. This testimony from a man avowedly out of all sympathy with proselytising effort may provide your supporters with some information as to the real nature of the work undertaken by your missionaries here, which appears to be little known, the more especially as they, like the plucky young fellows they are, seemed to have concealed the real hardships they endure."

Mr. Grubb has worthily earned his official title of Comisario General del Chaco y Pacificador de los Indios.

GENERAL.

The Junior Scientific Geography. Book I.—Physical Geography. By Ellis W. Heaton, B.Sc., F.G.S. London: Ralph Holland & Co., 1911. *Price* 1*s.* 3*d. net.*

This little book is based, with some modifications, on the author's *Senior Physical Geography*. It contains numerous diagrams, and will be found useful in preparing for examinations. A great number of simple experiments are described, and many questions are intercalated in the text, but there is not much that is distinctively modern in the treatment.

BOOKS RECEIVED.

Papua: A Handbook to its History, Inhabitants, Physical Features, and Resources, etc. Compiled from Government Records and other Sources by W. Charles Pritchard, M.A. (Melb.), D.D. (Toronto), with an Appendix on the Health Conditions of Papua by R. Fleming Jones, M.D. Sm. cr. 8vo. Pp. 96. *Price* 1*s.* 6*d.* London: Society for Promoting Christian Knowledge, 1911.

Burma: A Handbook of Practical Information. By Sir J. George Scott, K.C.I.E., with Special Articles by Recognised Authorities on Burma. New and Revised Edition with Numerous Illustrations by the Author and Others. Cr. 8vo. Pp. x + 520. *Price* 10*s.* 6*d. net.* London: Alexander Moring, Ltd., 1911.

Characteristics of Existing Glaciers. By William Herbert Hobbs. Demy 8vo. Pp. xxiv + 301. *Price* 13*s.* 6*d. net.* New York: The Macmillan Company, 1911.

Europe in Pictures. By H. Clive Barnard, M.A. Containing 57 Illustrations, 30 of which are in Colour, and also four Maps. Cr. 4to. Pp. 64. *Price* 1*s.* 6*d.* London: Adam and Charles Black.

Einführung in die Wirtschaftsgeographie. Production, Verkehr und Handel der Erde mit besonderer Berücksichtigung Deutschlands und der Deutschen Kolonien. Von Dr. Ernst Friedrich. Demy 8vo. Pp. 178. *Preis* 2 *m.* Leipzig: List und Von Pressendorf, 1911.

Description of Arthur's Seat Volcano (Memoirs of the Geological Survey, Scotland). By B. N. Peach, LL.D., F.R.S. Demy 8vo. Pp. 23. *Price* 6*d.* Edinburgh: Morrison and Gibb, Ltd., 1911.

The Fair Dominion: A Record of Canadian Impressions. By R. E. Vernide. With 12 Illustrations in Colour from Drawings by Cyrus Cuneo. Demy 8vo. Pp. xi + 296. *Price* 7*s.* 6*d. net.* London: Kegan Paul, Trench, Trübner and Co., Ltd., 1911.

The Pan-American Union: Peace, Friendship, Commerce. By John Barrett, Director-General of the Pan-American Union. Demy 8vo. Pp. 253. Washington, D.C.: Pan-American Union, 1911.

Chasses et Chasseurs Arctiques. Par le Duc D'Orléans. Avec 25 Gravures. Troisième Edition. Cr. 8vo. Pp. xxiv + 270. *Prix* 4 *francs.* Paris: Librairie Plon-Nourrit et Cie, 1911.

Nooks and Corners of Yorkshire. By J. S. Fletcher. With a Map. 12mo. Pp. xvi + 304. *Price* 2*s.* 6*d. net.* London: Eveleigh Nash, 1911.

Nooks and Corners of Old England. By Allan Fea. With 100 Illustrations from Photographs taken by the Author. Cr. 8vo. Pp. xi + 273. *Price* 5*s. net.* London: Martin Secker, 1911.

Uruguay. By W. H. Koebel. With a Map and 55 Illustrations. Demy 8vo. Pp. 350. *Price* 10*s.* 6*d. net.* London: T. Fisher Unwin, 1911.

Travels in Sunny Lands. By the Rev. Donald Maclean. With Coloured Frontispiece and Twenty-four other Illustrations. Demy 8vo. Pp. xvi + 157. *Price* 3*s.* 6*d. net.* Edinburgh: John Grant, 1911.

The West in the East from an American Point of View. By Price Collier. Demy 8vo. Pp. ix + 534. *Price* 7*s.* 6*d. net.* London: Duckworth and Co., 1911.

Philip's Geographical Pictures. Series II. in 20 Sheets. Edited by P. H. L. L'Estrange, B.A. *Price* 1*s.* 3*d. each.* London: George Philip and Sons, Ltd., 1911.

Strange Siberia along the Trans-Siberian Railway: A Journey from the Great Wall of China to the Skyscrapers of Manhattan. By Marcus Lorenzo Taft. 16mo. Pp. 260. *Price* $1.00 *net.* New York: Eaton and Mains, 1911.

Aberdeenshire (Cambridge County Geographies). By Alexander Mackie, M.A. With Maps, Diagrams, and Illustrations. Cr. 8vo. Pp. x + 198. *Price* 1*s.* 6*d.* Cambridge: University Press, 1911.

Meroë, the City of the Ethiopians, being an Account of the first Season's Excavations on the Site, 1909-1910. By John Garstang, D.Sc., M.A., B.Litt. With an Introduction and Chapter on Decipherment by the Rev. A. H. Sayce, D.Litt., LL.D., and a Chapter on the Inscriptions from Meroë by F. Ll. Griffith, M.A., F.S.A. Photographic Illustrations by Horst Schliephack. Demy 4to. Pp. viii + 87. *Price* 31*s.* 6*d. net.* Oxford: Clarendon Press, 1911.

A Handbook of Geography. By A. J. Herbertson, M.A., Ph.D. Vol. I. General Geography. The British Isles and Europe. Cr. 8vo. Pp. xii + 500. *Price* 4*s.* 6*d.* London: Thomas Nelson and Sons, 1911.

Highroads of Geography (The Royal School Series). Illustrated by Masterpieces of the following Artists: J. M. W. Turner, Vicat Cole, John Constable, etc. Book III. South Britain. Fcap. 4to. Pp. 192. *Price* 1*s.* 3*d.* London: Thomas Nelson and Sons, 1911.

Diplomatic and Consular Reports.—Trade and Commerce of the Azores, 1910 (4641); Trade and Commerce of Hungary, 1909-1910 (4644); Trade of the Consular District of Bahia, 1910 (4646); Trade and Commerce of the Morea and the Provinces of Ætolia and Acarnania, 1910 (4649); Trade of the Consular District of San Francisco, 1910 (4650); Trade and Commerce of the Consular District of Havre, 1910 (4651); Trade and Shipping of the District of Rotterdam 1910 (4654); Trade and Commerce of Bosnia-Herzegovina, 1910 (4652); Trade of Colima, 1910 (4653); Trade of Hakodate, 1910 (4655); Trade, Commerce, etc., of Asturias, Galicia, and Leon, 1910 (4656); Trade and Commerce of Porto Rico, 1910 (4657); Trade and Commerce of the Canary Islands, 1910 (4658); Trade of Bordeaux, 1910 (4659); Trade and Commerce of Norway, 1910 (4645); Trade of the Cyclades, 1910 (4647); Trade and Commerce of Ciudad Bolivar, 1910 (4648); Trade and Commerce of Genoa, 1910 (4660); Trade of Nagasaki, 1910 (4661); Trade of Liberia, 1910 (4662); Trade and Commerce of Tampico, 1910 (4663); Trade of Savannah, 1910 (4664); Trade of Vera Cruz, 1910 (4665); Finance of the Argentine Republic, 1909-10 (4666); Trade of Salina Cruz, 1910 (4667); Trade and Commerce of Corfu, 1910 (4668); Trade of Nanking, 1910 (4669); Trade and Commerce, etc., of Java, Sumatra, etc., 1910 (4670); Trade and Commerce of Finland, 1910 (4671); Trade of Teng Yueh, 1910 (4672); Trade of German South-West Africa, 1910 (4673); Trade of Calais, 1910 (4675); Trade of Corea, 1910 (4676).

Census of Ireland for the Year 1911. *Preliminary Report with Abstract. Price* 2½*d.* London: His Majesty's Stationery Office, 1911.

Census of Scotland 1911. *Preliminary Report on the Twelfth Census of Scotland. Price* 10*d.* London: His Majesty's Stationery Office, 1911.

Twenty-Ninth Annual Report of the Fishery Board for Scotland, being for the Year 1910. *Price* 1*s.* 7*d.* London: His Majesty's Stationery Office, 1911.

Colonial Report (Annual).—St. Helena Report for 1910 (675).

Publishers forwarding books for review will greatly oblige by marking the **price** *in clear figures, especially in the case of foreign books.*

NEW MAPS.

EUROPE.

ORDNANCE SURVEY OF SCOTLAND.—The following publications were issued from 1st to 30th April 1911:—

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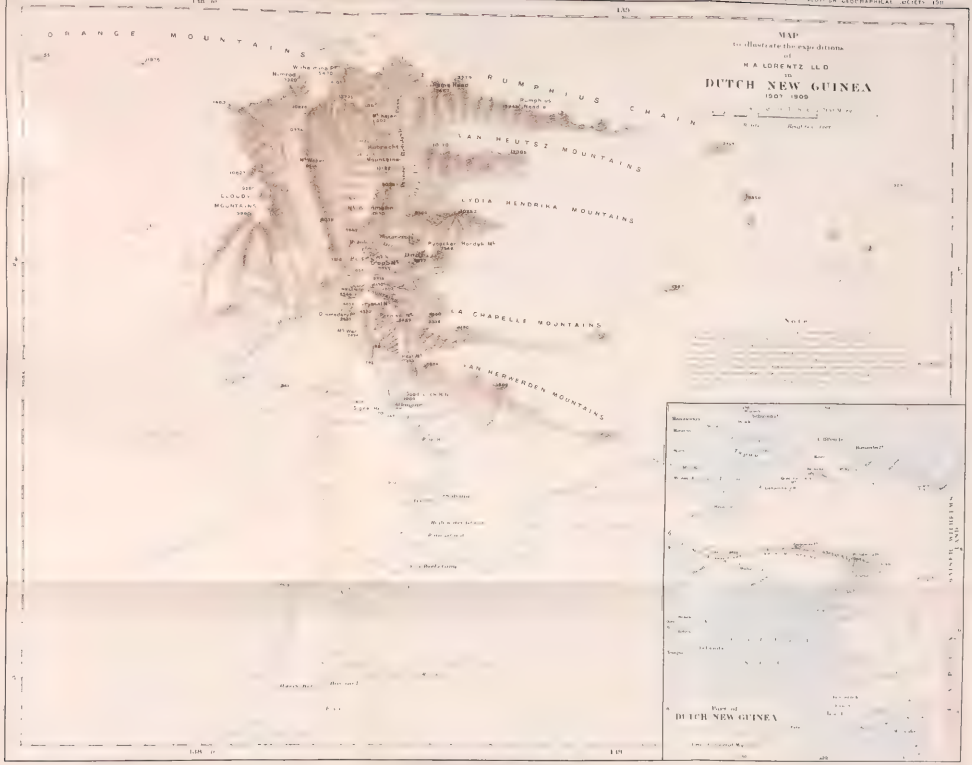
ORANGE MOUNTAINS
RUMPHIUS CHAIN
VAN HEUTSZ MOUNTAINS
LYDIA HENDRIKA MOUNTAINS
LA CHADELLE MOUNTAINS
VAN HERDEREN MOUNTAINS
CLOUD MOUNTAINS
Mt Wilhelmina
Mt Juliana
Mt Emma
Mt Carstensz
Mt Idenburg
Mt Sapiri
Mt Doorman
Mt Ophir
Mt Victoria
Mt Nassau
Mt Fredrik Hendrik
Mt Charlotte
Mt Cornelia

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

THE ARCHITECTURE AND ORIGIN OF THE ALPS.

By Prof. Jas. Geikie, LL.D., D.C.L., F.R.S.

(With Illustrations and Sketch-Map.)

No system of mountains has been so long and so laboriously studied by geologists and geographers as the great chain of the Alps. Every decade since the days of De Saussure has added to our knowledge of its structure and history, but until quite recently much still remained obscure and apparently inexplicable. Although it cannot be asserted that all the secrets of the Alps have now been unveiled, there can be little doubt that many of the most important problems suggested by the complicated and puzzling phenomena have at last been solved. The tale revealed by the rocks is a very remarkable one, and often, it may be added, hard to follow. If attention be fixed, however, on the chief points—on the salient features of the evidence—it is possible to obtain a not inadequate conception of the architecture and origin of the chain.

In the following brief account of the rocks and rock-structures of the Alps only meagre reference can be made to the geological history of the region. The long and involved story which the rocks have to tell of successive geographical and climatic changes cannot be discussed in these pages. Our present aim is merely to acquire as clear an idea as we can of the remarkable crustal movements that resulted in the formation of the chain, and to note the part played by denudation in the evolution of the mountains. It may be well, however, before proceeding further, to consider in a very general way how the stones used in the building of the Alps were brought together.

From a geological map of the area we learn that the constituent rock-masses belong to two great series: a lower or basement set, consisting chiefly of gneisses, schists, granites, etc., and an upper or overlying division of aqueous strata, such as limestones, shales, sandstones, etc. These later

formations rest upon the highly worn or much denuded surface of the basement crystalline rocks, and the latter are therefore, throughout extensive tracts, entirely covered and concealed. In many other places, however, the younger series is absent, and the old crystalline rocks are thus exposed over certain broad areas. They form, for example, the lofty massifs of Mont Blanc and the Aiguilles Rouges, the Bernese and Gotthard Alps, etc., and may be said, in a word, to constitute the backbone of the Swiss Alps.

With the particular history of the basement rocks we are not concerned. All that need be noted is the simple fact that they represent the southern maritime tract of an ancient land which had come into existence during the closing stages of the Palæozoic era. That land was throughout more or less mountainous in character and extended far north into what is now Middle Europe. It was bounded on the south by a much more extensive Mediterranean than that of our day. Coming into existence in post-Carboniferous times it persisted as a continental area for a very prolonged period, during which it suffered excessive denudation. Its chains and ranges were thus gradually reduced and degraded, and over wide tracts became replaced by undulating low grounds. Here and there, however, more or less prominent heights survived—the stumps and torsos, as it were, of the old mountains. Before the complete reduction of the land could be accomplished a movement of subsidence ensued. This depression affected the Alpine region especially, but was likewise experienced throughout extensive areas of Middle Europe. Slowly the reduced Alpine land sank—its more prominent heights enduring for a long time as gradually diminishing islands. The sinking movement, although now and again interrupted, may be said to have prevailed throughout the whole course of the protracted Mesozoic era. Immense deposits of sediment had thus ample time to accumulate over the slowly-subsiding sea-floor. When the dawn of the Cainozoic or Tertiary era approached, the ancient Palæozoic Alpine land had all but vanished—only a few small islands remaining, and by and by these too sank in the broadening Mediterranean. (See Fig. 1.)

In this way the drowned Palæozoic country was at last completely buried under a varying thickness of sediments—mostly marine. The submergence appears to have been greatest in the south and least in the north, but what are now the central parts of the Swiss Alps would seem to have been as deeply depressed as any. Owing to the irregular depths of the Mesozoic and Cainozoic seas, the sediments naturally attained their greatest thickness over what had been the lowlying tracts of the drowned land, and thinned away across the heights which had for so long a period survived as islands.

Thus the conditions that obtained over the Alpine area just before the great crustal movements of the Cainozoic era began were simply these:—an ancient much reduced mountain-land submerged and covered throughout by a vast succession of horizontal strata—reaching in some places a thickness of 10,000 or 15,000 feet. The buried land is built up chiefly of crystalline masses and some Carboniferous strata, while the overlying bedded series range in age from Permian and Triassic down to early Cainozoic. Geologists have no means of computing the time required

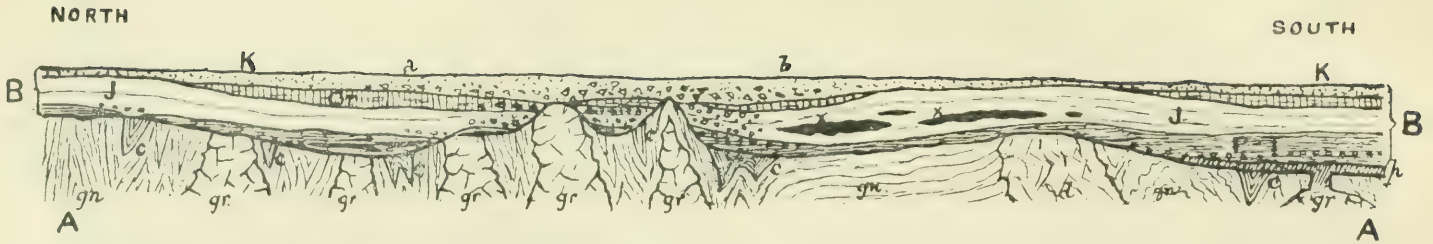

FIG. 1.—Schematic Section across the Swiss Alpine area, showing the general disposition of the older (A) and younger (B) series of rocks before the crustal folding of early Cainozoic times. (After Professor Schmidt.)

A Highly denuded Palæozoic (post-Carboniferous) land; *gn.* gneiss, etc.: *c.* interfolded Carboniferous strata: *gr.* granite, etc.; *d.* diorite; *p.* quartz-porphyry.

B Strata accumulated over A during period of prolonged submergence: P-T Permian and Triassic: J Jurassic; Cr Cretaceous; K Eocene: xx Igneous rocks. Breccias and Conglomerates developed chiefly in central tract between *a* and *b*.

[The breadth from north to south of this area, before folding took place, was apparently not less than 370 miles; after folding it was reduced to about 100 miles.]

for the accumulation of that most impressive succession of formations. But when we think of the many geographical and climatic changes—of the extensive evolution of life-forms—the successive appearance and disappearance of floras and faunas—that took place between the close of the Palæozoic and the dawn of the Cainozoic era, we are forced to admit that many millions of years must have been consumed in merely bringing together the materials for the construction of the present Alps upon the site of the old Palæozoic land.

These Alps may well be taken as a type of what are known as *folded mountains*,—a class which includes all the greatest chains and ranges of the globe—the Himalayas, the Rockies, the Andes, and many less conspicuous heights. All these owe their origin to movements of compression whereby the constituent rock-masses have been buckled up, dislocated, and displaced. The movements referred to are doubtless due to the wrinkling of the earth's crust over the slowly cooling and contracting interior. The crust having already cooled cannot contract to the same extent, and therefore as it subsides it is compelled to accommodate itself to the shrinking nucleus by folding and fracturing. The relief to compression may be expressed either by wide regional deformation of the crust—that is, by the bulging upward of extensive areas, accompanied not infrequently by much subordinate warping, flexing, and folding of a more or less gentle or moderate character. Cases of this kind are termed "regional uplifts." In other cases, however, the crust yields along some determinate zone of great length, it may be, but of relatively narrow width. Under such conditions compression usually results in the formation of more or less numerous steeply-inclined folds and in the horizontal displacement of great rock-sheets. The general character of the rock-folds and displacements in these "axial uplifts" naturally varies according to the degree of crustal compression. When the lateral pressure has not been excessive the folds may be more or less symmetrical in form, and relatively inconsiderable horizontal displacements may occur. But when crustal compression has been most vigorous, the resulting flexures, folds, and rock-displacements are correspondingly pronounced and often astonishingly complicated.

A few simple diagrams in illustration of these structures may help the reader to appreciate the salient features of mountain architecture. Fig. 2 represents the general character of the folds met with in mountain-uplifts where the degree of crustal compression has not been excessive. The folds, it will be observed, are symmetrical—their axial planes being vertical—and they are more or less "open," or, in other words, the limbs of the several folds are not closely compressed. In Fig. 3 we have a series of asymmetrical folds—the axial planes are here inclined, while the folds are no longer "open" but "close." Fig. 4 shows asymmetrical folds in a still more compressed attitude. The rocks in the cores of the folds have been thickened while those in the limbs have become attenuated. The strata have apparently been rendered plastic—the materials flowing away under extreme pressure to accumulate in places where compression was less severe. Rock-folds, however, are often much more highly confused and complicated. Not only are the strata flexed and doubled up in great anticlines and synclines, with axes lying at all angles, but the

individual beds constituting the folds may be exceedingly crumpled, puckered, and contorted, as shown in Fig. 5.

Reference has been made to the attenuation so frequently seen in the limbs of highly compressed folds. The process of compression has often proceeded so far as to result in the squeezing out of a limb

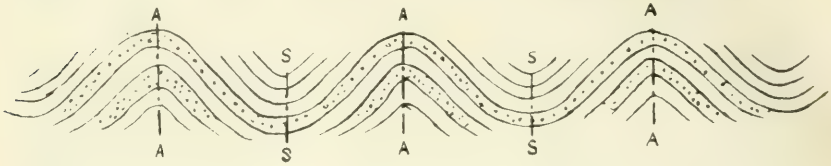

Fig. 2.—Symmetrical folds. AA Anticlines; SS Synclines. The upright dotted lines indicate the vertical axial planes.

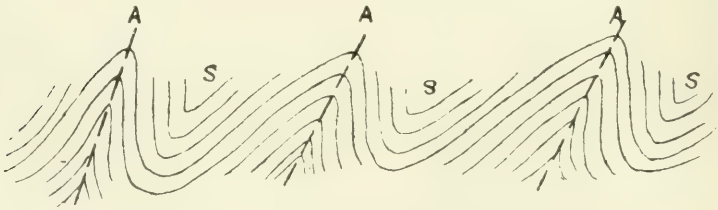

Fig. 3.—Asymmetrical folds with inclined axial planes.

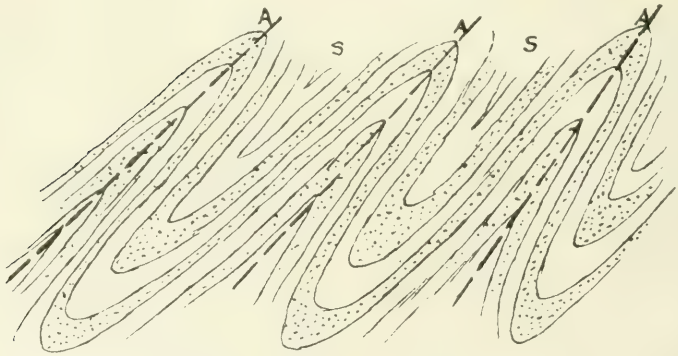

Fig. 4.—Much compressed asymmetrical folds; beds becoming thin in the limbs and thickening in the bends or cores.

altogether. Fig. 6 illustrates how the limb of a fold (A) under compression gradually becomes more and more attenuated (B), until eventually, it is replaced by what is known as an "overthrust fault"—the fold, in fact, has obviously given way, and the overlying portion has travelled upward along a plane of displacement (C). Faults of this steeply-inclined character are of common occurrence in all mountains of uplift, but the degree of displacement is seldom

considerable. In short, they are usually only of local and subordinate importance. It is frequently otherwise, however, with the displacements of recumbent folds (Fig. 7). In great mountain-uplifts folds of this type often occur on a gigantic scale, and could only have been caused by intense tangential pressure. It is, therefore, not surprising that in their case excessive rock-displacement should frequently have taken place—sheets of rock, thousands of feet in thickness, and of vast extent, having been forced to move along approximately horizontal

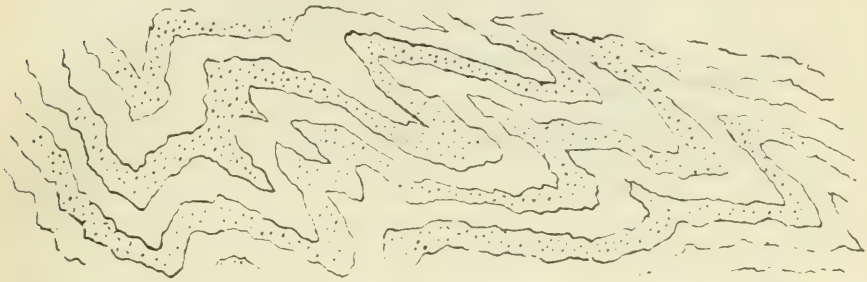

FIG. 5.—Contorted folds.

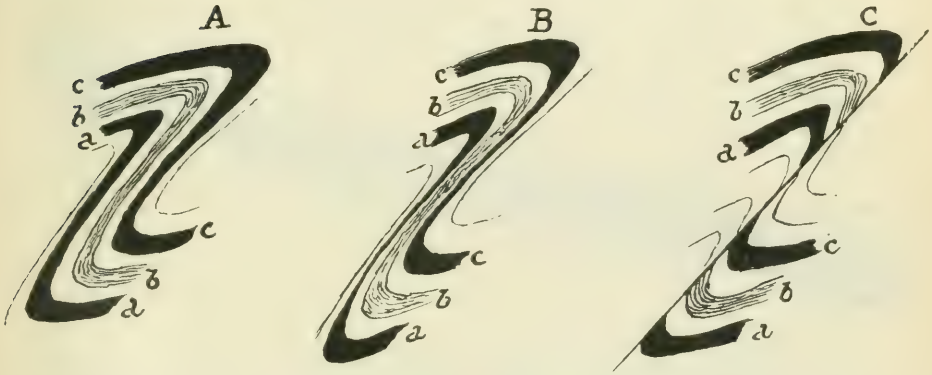

FIG. 6.—Stages in the passage of a highly-inclined fold into a reversed or overthrust fault.

planes or up gentle inclines, for distances of many miles. But rock-displacements on this grand scale have not always been preceded by folding. Frequently the rocks subjected to great tangential pressure have yielded without any preliminary doubling or buckling-up, and enormous slices or sheets have been driven successively for miles one over another (Fig. 8). Thus, partly by the rupturing of extensive recumbent folds and partly by direct displacement along horizontal or inclined planes, the oldest rocks in a mountain region frequently overlie the youngest—both kinds of crustal deformation having resulted from an irresistible thrust in some particular direction.

Such are among the more obvious phenomena which lead to the conclusion that "folded mountains" owe their origin to compression. Much additional evidence in support of that conclusion is supplied by a careful study of the rocks themselves, whether examined in hand-specimens by the unassisted eye, or studied in thin slices under the microscope. But into that evidence we need not go.

The great crustal movement to which the present Alps owe their

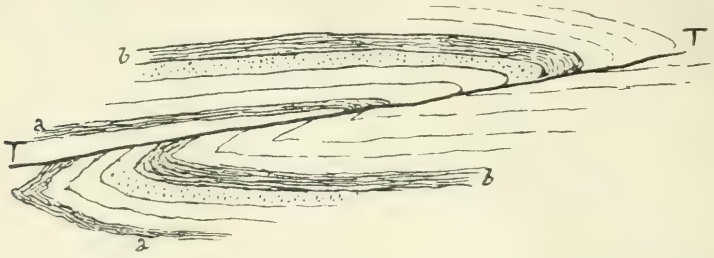

FIG. 7.—Faulted recumbent fold. TT thrust-plane.

FIG. 8.—Translated rock-sheets. *t t* minor thrust-planes or reversed faults due to tangential pressure, causing frequent repetition of strata=*imbricate structure.* TT major thrust-plane along which the higher-lying rock-sheet has been driven in the direction indicated by the arrow. The appearance of folding is probably the result of friction along the thrust-plane, causing the brow of the rock-sheet to curve over and become inverted.

origin followed a general northerly direction. It is, of course, hard to say to what extent the area undergoing compression was affected during the earlier stages of the movement. The probabilities are, however, that the first notable result of pressure would be the elevation of the sea-floor, and the appearance of a broad flat land extending over what is now the Alpine area. Even at that early stage a certain amount of warping of the new land surface may have taken place—the ground possibly rising and falling in long gentle undulations. At considerable

depths from the surface, however, crustal deformation would be more pronounced. The folds, at first symmetrical, would become gradually deformed and distorted or asymmetrical—the crowns of the anticlines leaning over more and more in the direction of movement, until they assumed a recumbent position and finally yielded to tangential pressure. Great rock-sheets of various thickness and extent would then begin to move up gentle inclines or to creep along approximately horizontal "thrust-planes." Meanwhile, the deeper parts of the folds—the synclines or so-called "roots"—tarrying behind, would tend under continued pressure to assume steep and vertical positions.

According to Swiss geologists the earliest "Decken" or rock-sheets to invade the northern zone of the Alpine area originated in a series of folds that were developed along the southern borders of what is now the lofty Aar massif, which as yet had not been elevated. The "roots" of the folds in question can be followed quite readily in a north-east and south-west direction from Chur to beyond Martigny. These earliest translated masses are known collectively as the "Helvetian sheets." They consist chiefly of Triassic, Jurassic, Cretaceous, and Eocene strata which have been driven bodily forward in North Switzerland over strata belonging to the same geological systems. Thus it happens that north of the Aar massif the same formations occur in duplicate—the exotic rock-sheets resting upon Mesozoic and Cainozoic strata which are autochthonous or native to the region: in a word, the latter occur *in situ*—they have not been moved from the place where they were originally deposited as sediments. It is worthy of note that both the exotic and the underlying autochthonous Mesozoic strata in question have an essentially Central European facies—that is to say, the rocks themselves and their fossil organic remains are more nearly related to those of Central Europe than to the corresponding fossiliferous strata of the Southern Alpine area, the facies of which is Mediterranean.

A second series of folds, developing into horizontal or inclined thrust-planes, appeared further south—chiefly south of the Gotthard massif which, like the Aar massif, had not as yet been elevated. This complex of imbricated and overlapping "Lepontine sheets," as they are called, moving gradually northward, eventually overspread and largely concealed the Helvetian sheets. The Lepontine rock-sheets, like their predecessors, consist mainly of Mesozoic and Cainozoic strata, but they are distinguished from the latter in several respects, more especially by their Mediterranean facies and by the presence of many breccias and certain igneous and other kinds of rock which are quite foreign to the Helvetian sheets. These and other phenomena characteristic of the Lepontine sheets show that this second complex of translated rock-sheets has travelled northwards from the central and southern Alpine area.

A third complex, known as the "East Alpine" sheets, originated further south still, and advanced over the Lepontine sheets, while yet a fourth series—the "South Alpine"—was driven forward from the very borders of the Alpine area in North Italy, so as to overlie the preceding East Alpine sheets. (See Map, Fig. 9.)

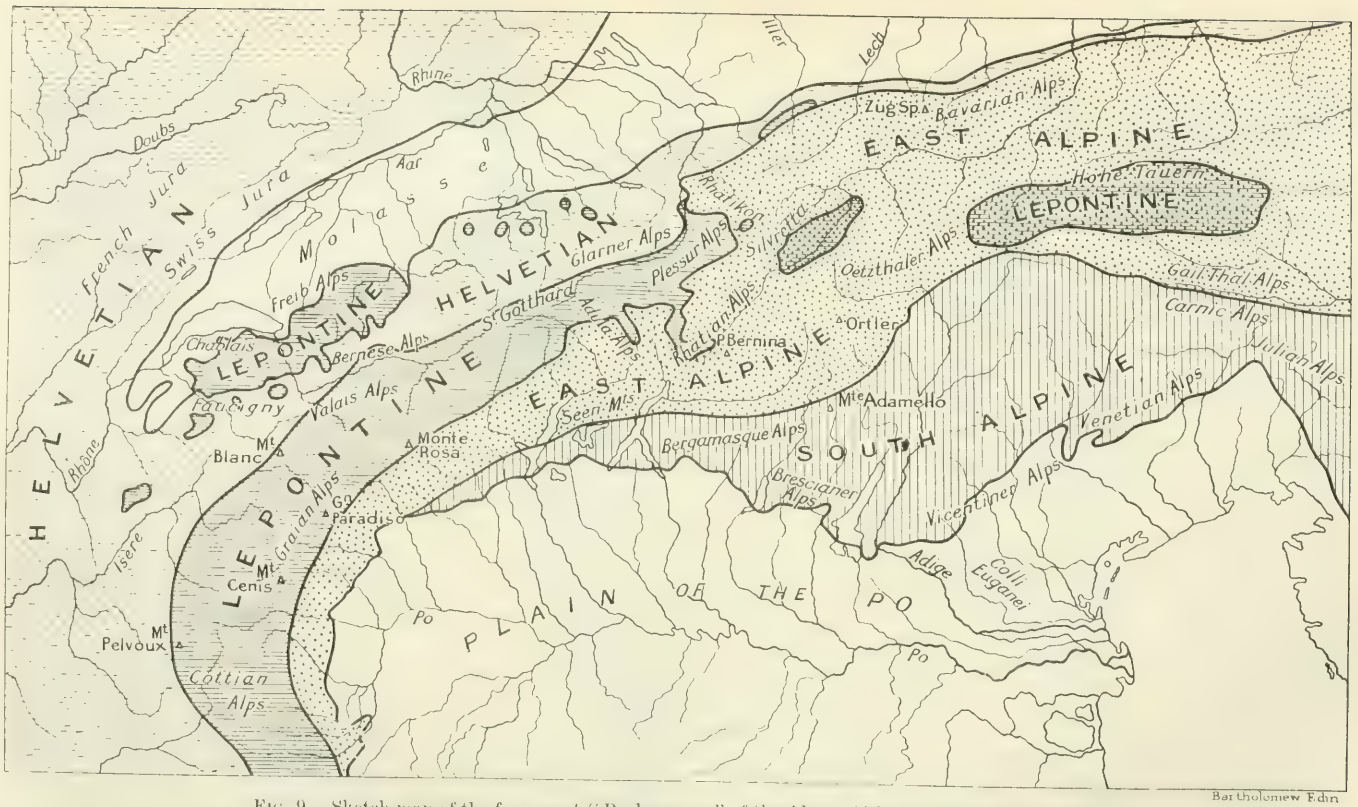

FIG. 9.—Sketch-map of the four great "Rock-groups" of the Alps. (After Professor Steinmann.)

These groups are termed respectively the Helvetian, the Lepontine, the East Alpine, and the South Alpine—each group having its own characteristic facies. The Helvetian is indicated by interrupted horizontal lines; the Lepontine by continuous horizontal lines—the inliers of the same sheet which look through the "windows" in the overlying East Alpine sheet, being shown by dots as well as lines; the East Alpine is indicated by dots; and the South Alpine by vertical lines.

Thus, several series of complex folds and overthrust rock-sheets were developed successively in the northern, in the central, and finally, in the southern zones of the Alpine area—each complex following, and eventually overtaking, and to some extent overlapping its predecessor. While the translation of these several sheets was in progress the downward bends of the original folds—the deep-seated "roots," although relatively stationary, were becoming ever more compressed and steeper, so as to occupy less space, and the interval separating one sheaf of "roots" from another necessarily diminished in proportion.

The roots of the latest or uppermost rock-sheets ("South Alpine," or "Crystalline," as they are sometimes termed) are succeeded southwards by strata which have not been pushed out of place—they are aboriginal or autochthonous, and range in age from early Mesozoic down to late Cainozoic. They are inclined towards the south at a somewhat high angle, but as the plains of the Po are approached, the angle of dip rapidly decreases. Nowhere do they show over-folding or horizontal displacements. In these respects, therefore, the autochthonous strata occurring along the southern borders of the disturbed area differ from the autochthonous strata occupying the corresponding position on the north side of the mountains, as will subsequently be pointed out more particularly.

While we are trying to picture to ourselves the conditions that obtained when rock-sheet after rock-sheet was being driven forward, we must bear in mind that the existing lofty mountain ranges had not as yet made their appearance. There may well have been a general bulging upwards of the whole compressed area, but the dominating massifs of our day—Mont Blanc, the Aiguilles Rouges, the Gotthard and Aar massifs—had not as yet shown themselves—their elevation belongs to a later phase of the great crustal movement. The invasion of the northern zone by exotic rock-sheets, therefore, was not opposed by any insuperable mountain-barrier. When the translation of successive rock-sheets had been completed, the ancient Palæozoic land lay deeply buried in Switzerland—the earliest travelled rock-sheets being covered and concealed by their successors. If it took millions of years to bring together materials for the construction of the Alps, long æons were required for the process of building—for piling up rock-sheet upon rock-sheet. Crustal movement had begun before the close of Eocene times, was continued throughout the subsequent Oligocene and Miocene periods, and had apparently not quite ceased before the advent of prehistoric man, if indeed it has even now completely died away. In a word, the movement of compression must have extended over several millions of years.

We come now to a very interesting episode in the history of the Alps. When the last of the exotic rock-sheets had ceased to move, North Switzerland appears to have been represented by an elevated tract extending in a north-east and south-west direction. In Miocene times an inland sea covered the site of the present Jura mountains, and laved the north front of the Alpine area, where it maintained its position for a prolonged period. This is proved by the simple fact that thick

masses of sediment had time to gather over the floor of the Miocene sea —all of them derived from the denudation of the Alpine area. Torrential streams and rivers swept down to the sea vast quantities of shingle and gravel, and doubtless waves ate their way into the land, and thus played a part in the work of degradation and accumulation. The shore-deposits of that ancient sea can still be followed all along the north front of the Alps, where they form a conspicuous range of subalpine hills and mountains that vary in height from about 4000 feet to upwards of 6000 feet. They extend almost continuously from Lake Constance to Lake Thun. Further west and south-west they fringe the Freiburg Alps, but in this region they are less conspicuous. The shore-deposits in question consist largely of massive conglomerates and pebbly sandstones, etc., known as "Nagelfluh" (Molasse).

The relation of the Nagelfluh to the exotic rock-sheets of Switzerland is of absorbing interest to the geologist. It would appear that when the Miocene shore-deposits began to accumulate, the great rock-sheets derived from the south had become passive. So far as we know, indeed, there may have been at that time a more or less prolonged cessation of all crustal movement. On the other hand it is quite possible that crustal creep may never have been quite interrupted. Earth-movements of the kind, so far as we have evidence to show, are usually protracted, and do not interfere with the processes of denudation and deposition. But whether or not all crustal deformation had temporarily ceased during the heaping of the Miocene beach-gravels, it is certain that the formation of the latter marks the close of the first phase of the great crustal movement.

That phase was characterised above all by the translation from south to north of massive sheets of rock, but no such remarkable displacements would appear to have taken place during the second and final phase of disturbance. Further, it may be noted that during the first phase the fundamental crystalline rocks of the central and northern zones of the compressed area were left comparatively undisturbed. They had been to some extent, it is true, sharply folded along with the younger overlying strata, but none of these folds had developed into extensive displacements,—the masses of ancient crystalline rocks had retained their position, while being traversed by rock-sheet after rock-sheet. During the second phase of deformation, however, — that, namely, which supervened after the heaping together of the Miocene beach-gravels — the fundamental crystalline rocks found relief from renewed compression partly by folding but chiefly by rising vertically. In a word, the grand massifs of Aar-Gotthard, of the Aiguilles Rouges and Mont Blanc slowly bulged upwards. At the same time the irresistible thrust that caused these upheavals affected all the regions lying to the north and north-west. The autochthonous or native strata of Switzerland, and the overlying exotic rock-sheets, which had already been much reduced by denudation, were now compressed into a succession of great asymmetrical folds, the crowns of which as usual leaned forward in the direction of movement. At the same time the subalpine tracts and the immediate forelands of the Alps became relatively depressed.

Long before this stage, however, the upper rock-sheets in north-east Switzerland had been largely denuded away, leaving the underlying Helvetian sheets exposed over an extensive area. Now strongly compressed, these sheets rose in a series of gigantic folds and were thrust with such persistence against the massive Miocene conglomerates that the latter were doubled back upon themselves and overridden. Nor was the disturbance confined to this border region: it affected the entire Alpine area, all the contiguous low-lying Molasse land, and the region of the Jura beyond. It was at this particular stage, in fact, that the folded ranges of the Jura came into existence. The upheaval of these mountains, in a word, was coeval with that of the lofty limestone ranges of the Säntis. (See Fig. 10.)

It is not easy to realise the changes that took place during the first and second phases of the mountain-making process within the Alpine area, but the accompanying diagrams (Fig. 11) by Professor Steinmann may

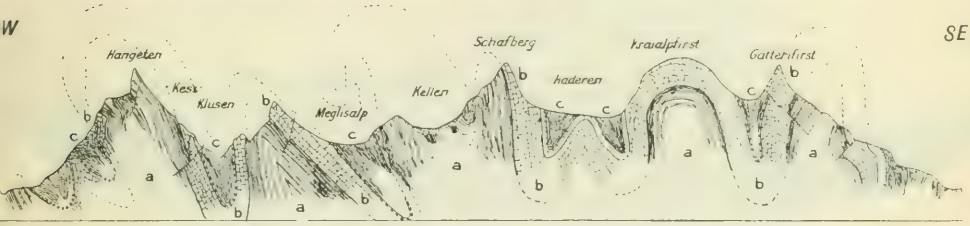

FIG. 10.—Section across the Säntis Mountains. (Reduced from Prof. Heim's large section.)

a. "Neocomian"=marls, shales, shelly breccias, etc.
b. "Schrattenkalk"=chiefly hard limestone, 600 to 650 feet thick.
c. "Seewerkalk," etc., impure limestones, shales, etc.

The great folds owe their origin to the second phase of crustal movement, and are therefore relatively well preserved as compared with the older folds of the Alps, formed during the first phase of crustal compression. Length of section (which is on a true scale), about 4½ miles.

assist the reader. In A we see the original position of the several rock-masses before crustal movement commenced. The Mesozoic rocks of the northern zone are indicated by 1, while 2 and 3 represent those of the central and southern zones respectively—the old crystalline rocks (black) underlying all. B shows the formation of the recumbent folds and rock-sheets. In C the rock-sheets are represented as having undergone great denudation, and the Miocene beach-deposits, etc. (Molasse) are seen resting upon the eroded surface of the sheets. D shows the results of the second phase of crustal movement. The fundamental crystalline rocks have now been relatively elevated, as in the Finsteraarhorn massif, while the area to the north has been relatively depressed—the Molasse being buckled up and overlaid by the folded rock-sheets. In these sections Professor Steinmann has necessarily ignored subordinate details and suggests only the dominating features of the geological structure. The lines continued above the surface of the ground (D) indicate the rock-masses removed by denudation.

There is one characteristic of the Helvetian folds of the Säntis to

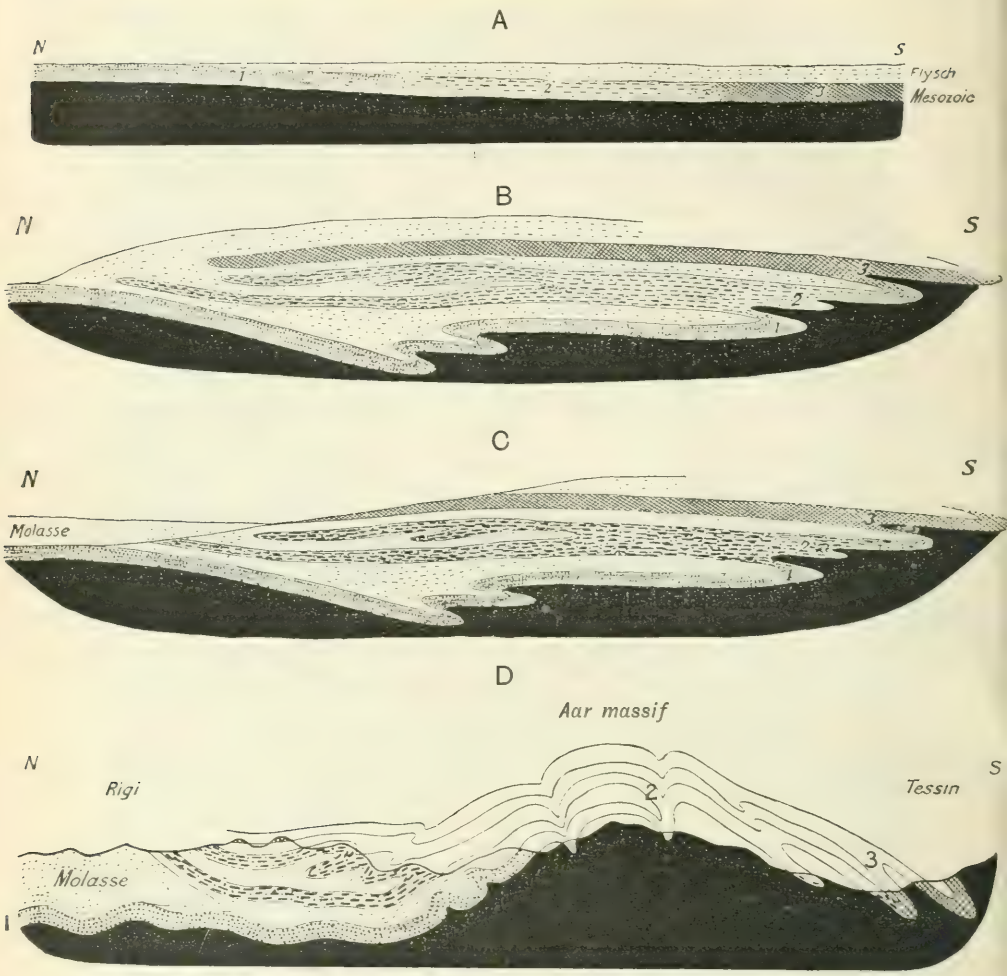

FIG. 11.—Schematic Representation of the Evolution of Mountain-structure in the Alps of North Switzerland. (After Professor Steinmann.)

A shows the stratified rocks (Mesozoic and Flysch) resting in undisturbed position upon the old crystalline rocks (black)—the crustal movements not having commenced. The figures 1, 2, 3, indicate the three distinctive "facies" of the Mesozoic systems that succeed each other, from north to south. (This diagram must be supposed to be double the size of either B C or D, for it represents the region before compression had taken place.)

B represents the formation of successive rock-sheets—one having moved over another. The uppermost rock-sheet has its "roots" furthest south.

C shows the region after the rock-sheets had suffered much erosion. The Miocene Molasse is seen resting upon a denuded surface.

D displays the general aspect of the region after the second phase of crustal movement. The Aar massif has become relatively elevated, and the foreground on the north has been relatively depressed. The rock-sheets have been buckled up and overthrust upon the Molasse. The lines continued above the surface of the ground indicate the amount of rock removed by denudation.

which brief reference may be made. They present certain features which distinguish them from the great recumbent folds occurring well within the Alpine area. The latter originated at considerable depths and were subject, therefore, to the weight of enormous rock-masses, so that when lateral compression ensued they behaved like plastic bodies,

Photo. by Wehrli.

FIG. 12.—The Great Spannort.

and were flexed, sharply-folded, puckered, and crumpled without breaking. Along the north front of the Alps, however, the strata that were thrust against the Nagelfluh, not being loaded down to nearly the same extent, did not become plastic under the folding process, and consequently were cracked, fissured, fractured, and shattered.

The thick masses of sedimentary strata—partly autochthonous, partly exotic—that formerly overspread all the area presently occupied by the lofty central massifs must have been broken up and removed at an

early period. The upheaval of the fundamental crystalline rocks had lifted them into a region where subaerial waste is always carried on most actively, and their demolition must therefore have been rapidly effected. Not improbably, indeed, they may have been removed long before the massifs had reached their greatest elevation. A few relics, however, may still be seen capping the schistose rocks of the Aar massif—such, for example, as the acute peaks (Fig. 12) of the Great Spannort (10,500 feet), and the Little Spannort (10,300) overlooking the Engelberg valley. In the same district another small outlier or remnant has been left to form the tip of the Krönte (10,200 feet), a mountain at the head of the Erstfeld valley. Although thus swept away from wide high-lying tracts, autochthonous strata and considerable fragments of exotic sheets still occupy much of North Switzerland. Needless to say the latter are quite cut off and widely parted from the regions whence they came. The Helvetian sheets that form the Limestone Alps of north-east Switzerland, for example, are separated from their "roots" by the lofty snow-clad heights of the Finsteraarhorn massif; and the Lepontine and East Alpine sheets, derived from more southern zones, are still more widely sundered from their "roots."

It is only recently that the alien or exotic character of these rock-sheets has been recognised. And now that geologists know them for what they are, certain phenomena hitherto deemed inexplicable, receive a ready explanation. The occurrence in the Miocene conglomerates of many kinds of rock that could not have come from the adjacent Alps, has long been a sore puzzle. It was quite obvious that the conglomerates of the Rigi, Rossberg, Hohe Rhonen, Gäbris, etc., were shore deposits, which could only have been derived from the denudation of mountains near at hand, but nowhere in the adjacent Limestone Alps could the source of the stones be discovered. Among them some were akin to rocks occurring in the eastern Alps, while others could only be matched in the central and southern zones of the Alpine area. How to account for the introduction of these to the Miocene sea was the difficulty. Now that difficulty vanishes when we learn that the coast of the Miocene sea was formed by the rocks of the Lepontine and upper rock-sheets—immigrants from the central and southern Alpine zones. Only after these sheets had been removed by denudation were the underlying Helvetian sheets laid bare along the north front of the Alpine area. At the time the Miocene conglomerates were being accumulated the latter still lay deeply buried.

For over a hundred years the appearance of large erratics or wandered blocks in the Eocene "Flysch" of North Switzerland has likewise been a hard nut to crack. Some of these have a resemblance to rocks occurring in the Finsteraarhorn, while many others (*e.g.* breccias, granites, etc.) are identical with rocks that abound in the central and southern Alps. All the blocks, in short, are exotic — none being identified as native to the region where they occur. Speculation has been rife as to how they were carried. One of the latest views was that floating ice may have brought them from the south side of the Alps at a time when there was free communication across the central

chain between the Eocene seas lying north and south of the Alpine area. We now know that they are simply fragments, large and small, detached from the Lepontine rock-sheets, while these were advancing across the Eocene "Flysch." It is not hard to understand how detached blocks of the kind would often be dragged or rolled for shorter or longer distances before they were crushed and pressed into the relatively soft Eocene deposits. Many occur sporadically, others appear in groups. Blocks ten feet in diameter are not uncommon, but very much larger masses are occasionally met with. In the valley of Habkeren, in the Bernese

FIG. 13.—The Great and Little Mythen and Rote Fluh.

These mountains have no roots, but consist of exotic Jurassic and Cretaceous rocks which rest upon the much younger Flysch. The mountains are simply gigantic "erratics"—isolated fragments of the Lepontine rock-sheet.

Oberland, for example, one measures 105 feet in length, 90 feet in breadth, and 45 feet in height. Many blocks have their angles rounded off, and some are approximately spherical—probably the result in most cases of subsequent "weathering." For while not a few are still anchored in the "Flysch," others released by erosion lie scattered over the surface. Possibly some of these loose erratics may never have been detached as separate blocks from a parent rock-sheet at the time of its advance, but may simply be fragments derived from the gradual break-up and disintegration of the latter *in situ* long after it had become passive. They may be analogous, in short, to the "greywethers" or "sarcen-stones," so often met with in the soils of the English Chalk Downs, which are believed to be relics of certain Cainozoic beds that

formerly covered broad areas in southern and south-eastern England, just as the Lepontine rock-sheets must at one time have overspread the region where the exotic or erratic blocks of North Switzerland are found.

More remarkable than these erratics of the "Flysch," however, are certain isolated hills and mountains, and even continuous ranges, which occur in the same region, and which like the erratics are of alien origin. Their exotic character is demonstrated by the simple fact that they are "mountains without roots"—they have no genetic connection with the pavement rocks on which they rest, for the latter are much younger than the masses above them. Between the valley of the Rhine and Lake Thun, for example, and particularly in the neighbourhood of the Lake of Lucerne, there are certain prominent hills and mountains, such as

Fig. 14.—The Mythen photographed from a balloon. (After Prof. C. Schmidt.)
The mountains have all the appearance of being afloat upon the Flysch.

the Mythen (see Figs. 13, 14), Mördergrube, Buochserhorn, Stanserhorn, and the Giswiler Stock (west of the Lungern See)—heights of 6000 feet or more, all of which are built up of rocks quite foreign to that region. They are in fact immigrants—isolated fragments of the great Lepontine sheets of Mesozoic rocks which, during the earlier phase of the mountain-making process, were thrust forward from the south, and came to rest at last upon the much younger Eocene strata of North Switzerland. Such outlying remnants of the travelled rock-sheets or "Decken" are called by Swiss geologists "Klippen," for which we have no satisfactory equivalent in English, unless we may substitute the geographical term "drongs," as used in Shetland.[1]

[1] The English translation of Klippe—"crag, cliff, or rock"—is rather indefinite, and hardly conveys the meaning of the word as used by Swiss geologists. "Stack," often applied in north-east Scotland and Scandinavian countries to isolated upstanding rocks on a sea-coast, comes nearer to the meaning. But "stack" has other significations besides that of "a

Elsewhere in Switzerland alien rock-masses often extend continuously over considerable areas, but their true character is exposed again and again in numerous gorges, ravines, and valleys—the torrents, streams, and rivers having cut their way down through the whole thickness of migrated sheets, and laid bare the pavement of native or autochthonous strata on which they rest. When the travelled sheets, consisting of Triassic, Jurassic, and Cretaceous rocks, overlie the much younger Cainozoic strata, their alien origin is at once betrayed. In other cases both pavement rocks and superjacent sheets may be of Mesozoic age, but the former have a Central European facies and obviously belong to the place where they occur, while the exotic character of the latter is shown by their Mediterranean facies.

A few words descriptive of the structure and present distribution of the several migrated rock-sheets may be added. As already mentioned, quite a number are recognised, of which the most important are the Helvetian, the Lepontine, the East Alpine, and the South Alpine or Crystalline. Each of these is a complex of several subordinate sheets, the structure or arrangement of which shows that one has moved over another. Along its terminal front (when that has escaped erosion) each sheet seems to attain a maximum thickness, and appears as an enormous recumbent fold. The major plane of movement (thrust- or sole-plane) of a complex sheet is usually more or less smoothed and striated, but the middle limb of the fold, which this plane is supposed to represent, is often wanting, having apparently been squeezed out when it finally yielded to the *vis a tergo*. Now and again, however, an attenuated middle limb can still be followed for some distance. It is perhaps not without significance that the chief planes of movement not infrequently coincide with the Eocene "Flysch-schiefer" or with the similarly soft "Bündnerschiefer," which may have served as lubricating materials to facilitate the passage of the overriding more resistant rock-masses.

Although many of the translated rock-sheets would seem to have originated as much flattened or recumbent folds, it may be doubted whether such was always the case. The major "sole-planes" of the Alps bear a strong resemblance to the "thrust-planes" of our own north-west Highlands. Scottish geologists have shown that enormous sheets of rock, yielding to lateral pressure, have been forced one over another in successive gigantic slices, without preliminary folding. Nevertheless along the terminal front of such a great rock-slice over-folding is sometimes conspicuous. Not improbably this structure may have been developed by friction at the base of an advancing sheet—the resistance to movement having caused the brow of the latter to curve and curl over, and so to become inverted and infolded to a less or greater extent under the sheet itself. (See Fig. 8.) It thus seems not unlikely that such may be the origin in many cases of the overfolding and con-

pillar-like rock standing separate from a line of cliffs." The word "drongs" suggested above has only one meaning, being applied to prominent peaked rock-masses occurring in the sea at some distance from the land. It is probably an Old Norse word; at all events, high sea-girt rocks lying off the coast in Iceland, the Faeroes, and Norway are often called "Drangur"—*i.e.* isolated or lonely ones.

sequent thickening of the Alpine "Decken," which are so characteristic of their terminal fronts. One cannot, in short, help suspecting that it has been too often taken for granted that each sole-plane in the Alps represents the middle limb of an enormous recumbent fold, drawn out till it thinned away and was subsequently replaced by a fault or horizontal displacement. The fact that such sole-planes so frequently coincide with the least resisting strata would seem to indicate that these last were planes of weakness or minimum resistance along which the rock-masses yielded most readily to lateral thrust.

Although geologists who have made a special study of the Alps are agreed as to the translation from south to north of vast rock-sheets, there are still many enigmatical phenomena connected with the genesis and movement of the immigrating masses which future research must be left to explain. It is very difficult to picture to ourselves the conditions that may have obtained while one rock-sheet was advancing over another. Before the earliest sheet began to move forward it is probable, as we have seen, that lateral compression had succeeded in causing the entire Alpine area to bulge upward. A broad swelling or "geanticline," with perhaps subordinate undulations of the crust, may have come into existence, and extended in a general east-and-west direction along the middle zone of the region. With continued pressure more or less pronounced folding would doubtless be developed at some depth within the geanticline. Compression increasing, many folds would by and by become inverted and overthrusts would be produced, or great slices would be driven forward without preliminary folding. Upon the southern slopes of the geanticline each ruptured fold or detached sheet would travel up a gentle incline until the crown of the primeval swelling was attained. Thereafter the sheets, one following another, would begin to descend the northern slopes of the great bulge, which may or may not have been inclined at a greater angle than the southern slopes. Some geologists have suggested that the successive piling of one sheet upon another, and possibly also a synchronous elevation of the geanticline, may have combined to render the descent to the north so steep as to induce the wholesale gliding of the travelled masses—sheet after sheet, under the influence of gravity, "flowing" downwards and burying its brow in the soft Eocene strata of the foreland. Those who hold this view assume that a broad and deep depression must have extended along the base of the geanticline, in order to accommodate the enormous rock-masses descending from its brow. By the descent of these masses, which now form the lofty border ranges of the Alps, extending from Säntis to the Diablerets, the depression was filled up, and at a subsequent date the entire region became elevated. Whether or not this view may approximate to the truth we do not know—it is at present purely conjectural.

Owing to the extraordinary denudation of the Alps, it will readily be believed that the several travelled rock-sheets are now in a very tattered condition. The Helvetian, whose "roots" appear in the valleys of the Vorder Rhine and the Rhone, has been cleared away from the Aar massif, but puts in a strong appearance north of that massif, where

it constitutes the border ranges of the Limestone Alps, stretching from Säntis and Churfirsten south-west to the Lake of Lucerne, Lake Thun, and the Diablerets. The Lepontine, the "roots" of which occur chiefly south of the Gotthard massif, formerly covered the Helvetian extensively, but has since vanished from wide areas. Its most conspicuous remnants in North Switzerland form the "Voralps" of Chablais and the Stockhorn, and the pre-Alps of the Bernese Oberland up to the foot of the Diablerets and the Wildstrubel. East of the Lake of Thun it is represented by the Klippen or Drongs already described. Its most extensive exposure, however, occurs further south, and comprises the mountains of Graubünden that border on the Vorder Rhine, the Alps of Valais, the Graian Alps, etc. Overlaid on the south by the East Alpine sheet, it continues eastward under that sheet for an unknown distance. Its prolongation in that direction, however, is proved by the notable fact that in Lower Engadine it peers through a great aperture, or "window" as it is called, in the overlying East Alpine sheet. In the region of the Hohe Tauern a similar but much larger "window" has been opened in the same far-spreading sheet, through which look out the Lepontine masses of the Gros Glockner and its giant associates. (See Map, Fig. 9.)

The South Alpine sheet occurs furthest south, and consists chiefly of a complex of old crystalline rocks which have been driven forward from the southern margin of the Alpine area. This sheet appears to have formerly extended over wide tracts of the central region, from which it has since been largely removed by denudation. One considerable remnant is the great cake of gneiss that spreads from south-west to north-east across the central Alps from Mont Emilius to the Weisshorn. Two of the more prominent peaks developed by denudation in the sheet are the Dent Blanche and the Matterhorn—mountains without roots, therefore, which have travelled some thirty or forty miles from the place of their origin in Piedmont.

And here we may note a certain rather marked contrast between the ancient crystalline rocks of the northern and southern zones of the Alps. The massifs of Mont Blanc, the Aiguilles Rouges, Aar, and Gotthard were highly compressed, and to some extent sharply interfolded with the younger stratified rocks that formerly covered them, but none of these folds developed into extensive displacements, nor were any great slices forced from the massifs and pushed forward as rock-sheets. It was quite otherwise, however, with the corresponding rocks of the southern zone —immense sheets of the old crystalline masses having been thrust for many miles over rocks younger than themselves.

From the foregoing brief account of the essential characters of Alpine architecture, it may be gathered that the occurrence of older overlying younger rocks is much the most notable. "Inversion," as it is termed, is the outstanding feature in the structure of the mountains. Although the full meaning of this structure has only been realised within recent years, the fact that inversion did occur has long been known, and even to some extent correctly interpreted. Recumbent anticlines and inverted strata were observed many years ago in the Alps and other regions of mountain-uplift. Professor Heim, in his classical work on the mechanism

of mountain-formation,[1] gave an admirable description of the remarkable rock-structures met with in the Tödi-Windgällen group, and showed by means of maps and excellent profile sections how large a part was played by inversion in the architecture of that region. So clearly is the evidence set forth in this masterly monograph that the author's explanation of the perplexing structures was for a long time accepted as satisfactory. There were certain phenomena connected with the great overfolds, however, for which it was hard to account. In a simple overfold the rock-movement has obviously been in one direction—if the crown or brow of a recumbent anticline faces north, the thrust must obviously have come from the south. But in the Glarner region the structures were apparently inexplicable, save on the assumption that here we had to do with two overturned and flattened anticlinal folds approaching each other from opposite directions—the crown or brow of the one looking

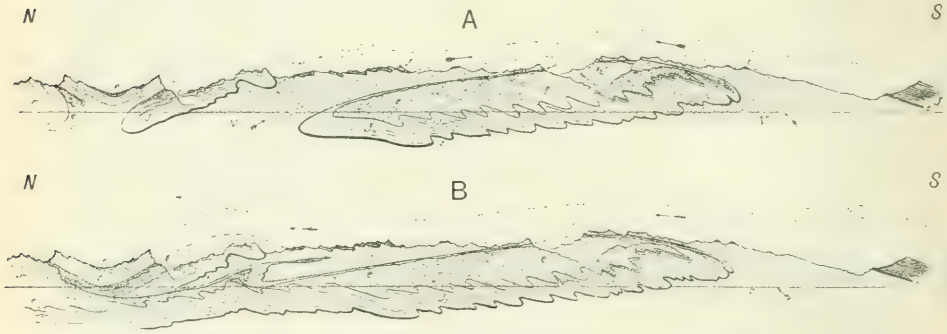

FIG. 15.—Schematic Sections of the folded strata of the Glarner Region.
A. The Glarner "Double-fold" according to Escher and Heim (1870-1902).
B. The Glarner "Rock-sheet" according to Bertrand (1883), Suess (1892), Heim (1903).
m. Molasse (Nagelfluh); *e.* Flysch; *c.* Cretaceous strata; J. Jurassic strata; *t.* Helvetian Trias; V. Verrucano (Permian conglomerates). (From Heim's *Der Bau der Schweizeralpen.*)

north and facing that of the other which looked south. This structure, surmised long ago by Escher v. der Linth, was described by Heim as a "double-fold"—the two recumbent anticlines enclosing between them a great synclinal trough of much disturbed and convoluted strata. There was no direct evidence, however, for the existence of the two recumbent anticlines—their crowns could nowhere be seen. A glance at Heim's section (A, Fig. 15) shows, indeed, that the supposed "double-fold" is quite hypothetical, for he represents the anticlines by dotted lines. B (Fig. 15) is a section across the same region, with the late Professor M. Bertrand's interpretation of the structure, indicated, as in Heim's section, by dotted lines. According to the explanation given by Escher and Heim it would seem as if crustal movement had taken place in diametrically opposite directions: the later interpretation, however, shows that movement has been in one direction only—one great rock

[1] *Untersuchungen über den Mechanismus der Gebirgsbildung*, etc., 1878.

sheet has been thrust forward from south to north over the whole region.

Other kinds of folds described by Heim would similarly seem to imply contradictory earth-movements. On a limited scale, no doubt, movements of the kind might occur in consequence of a thrust in one determinate direction. A thick rock-sheet driven forward, say from south to north, might under certain conditions be overfolded in some place or places towards the south. If, for example, a rock-mass advancing northwards were interrupted by some abrupt obstacle, a certain amount of back-folding might be expected to take place immediately in front of the obstacle. The back-folding, however, would be only of local occurrence, such, for example, as that developed on the south side of the Gotthard massif. One can hardly believe that inversion on so gigantic a scale as that of the Glarner could have been the result of back-folding, caused by the heaping-up and buckling of the strata against a steadfast obstruction. It is generally admitted, however, that a certain amount of back-folding does occur in the Alps, as on the south side of the Gotthard, and along the junction of the Limestone Alps with the Miocene molasse. Further, it may be noted that the rock-folds of the Limestone Alps in North Italy not infrequently lean over to the south.

But according to MM. Bertrand, Lugeon, Schardt, Schmidt, Steinmann, Termier, and indeed all recent observers, no extensive recumbent double-folds, either anticlinal or synclinal, occur anywhere in the Alps. The great inversions are everywhere explained by overfolding and horizontal movement in one general direction, and on a much grander scale than even Heim had suspected. The last-named geologist is now of the same opinion himself, and has within recent years adduced much additional evidence in support of the new doctrine. No one indeed has stated the facts and set forth their interpretation more clearly. Not only has he frankly abandoned his former views, but by newer researches he has shown that the conception of Alpine structure so boldly outlined by Marcel Bertrand is applicable to every part of the great chain which has been critically examined.

While overfolding and extensive thrust-planes are the most characteristic features of Alpine architecture, it must not be forgotten that compression resulted also in the bulging-up or general elevation of the entire Alpine area. Many years ago Professor Heim was of opinion that if all the Alpine folds could be smoothed out, and the strata could regain their original undisturbed position, they would necessarily extend over a much wider area: the two points Zürich and Como, for example, would be farther apart by some 120 to 150 kilometres. This estimate, he now thinks, is considerably under the mark. According to him the Alpine area before compression was a flat land, measuring probably 600 to 1200 kilometres across. Instead of this broad, low-lying tract, we have now a lofty mountain-chain averaging not more than 150 kilometres in width!

Some passing reference has been made to the denudation of the Alps. The most cursory examination suffices to show that the form

or configuration of the mountains seldom or never coincides with their geological structure—the irregularities of the surface rarely appear to be an expression of the arrangement of the rocks underneath. Here and there some approximation to an agreement of the kind may be discerned, but even in such cases it is quite obvious that the actual surface is not original, but the result of denudation. Such enormous quantities of material, in fact, have been removed from the Alpine area that many geologists do not doubt that the mountain masses that remain bear only a small proportion to those which have gradually been carried away.

The uplift of the Alps commenced, as we have seen, in Eocene times, was continued all through the Oligocene and Miocene, and practically completed at or about the beginning of the subsequent Pliocene period.[1] Equilibrium and repose may have been attained somewhat earlier in the southern than in the northern zone, but this cannot be demonstrated. All we know is, that the existing valley-system of the southern Alps had come into existence before Pliocene times, so that when subsidence ensued during that period the great valleys on the south side of the chain became sea-lochs. As no marine deposits of Pliocene age occur anywhere on the north side of the chain, we cannot be sure that the valley-system of the Swiss Alps was as well developed-in Pliocene times as that of the Italian Alps. On the other hand, there is no evidence that would lead us to believe otherwise. The probabilities are that the two sides of the chain bore much the same relationship to each other then as they do now—in a word, it is most likely that the development of their several drainage-systems proceeded *pari passu*.

Denudation must have commenced with the first appearance of the Alpine area as dry land, and doubtless continued without pause throughout the whole period of mountain-growth. Thus, long before the final phase of crustal compression had been inaugurated, a prodigious amount of erosion must have been effected. The Miocene molasse, with its great masses of shingle, gravel, and sand, is sufficient evidence of that. And if denudation was in active progress during the first phase of crustal deformation, we may feel sure that the final phase was in like manner accompanied throughout by never-ceasing erosion.

What the direction of its drainage-system may have been when the Alpine area appeared above the level of the Eocene sea can only be conjectured. The land probably at first showed a somewhat level or flat surface. Even at that incipient stage, however, there may have been a slight axial bulge sufficient to form an east-and-west or a north-east and south-west watershed. If that were so, then transverse streams and rivers would be the earliest to appear. When the crustal movement had been in progress for some time, the larger longitudinal

[1] This statement must not be taken too literally. Some minor deformation appears to have taken place in Pleistocene times, and it is quite possible that the frequent tremors and earthquakes which still affect the Alpine area may be an indication that crustal movement has not yet finally ceased.

folds must have wrinkled the surface and influenced the drainage. It is not improbable, therefore, that at a very early stage in the development of the Alps both transverse and longitudinal rivers had come into existence.

When we are speculating on the effect produced at the surface by crustal deformation, we must remember that the complicated rock-structures everywhere conspicuous in the Alps originated under an enormous thickness of strata. Flexures and folds of the kind could therefore have had only a moderate influence on the configuration of the surface. No doubt deep-seated rocks must frequently have snapped under stress and strain, causing tremors, jarrings, and earthquakes, so that rock-falls and landslips at the surface may often have occurred, and brought about multiform local modifications of the drainage. It is highly probable, moreover, that crustal compression may again and again have expressed itself at the surface by elevations of a more or less pronounced kind, which would bring into existence many younger streams and rivers. There is no evidence, however, to suggest that the subterranean processes referred to ever resulted in wholesale revolution of the Alpine drainage-system. It is hardly credible that rock-sheets, thousands of feet in thickness and hundreds of square miles in extent, were driven forward rapidly, or that they slipped down slopes after the manner of avalanches. Had catastrophic movements of the kind occurred some evidence of them should be forthcoming. But so far as can be judged from the present disposition of their drainage-system, the Alps do not seem to have experienced any such strange revolutions at the surface. The directions of the more important rivers were probably determined at an early date—the leading features of the whole system of drainage having been roughly outlined long before the land had attained any considerable elevation. The modifications it has since undergone are due doubtless partly to deformation of the surface by crustal compression, whereby new water-courses have come into existence and entered into competition with their predecessors. Many modifications of the drainage, however, must be attributed to the erosive action of the rivers themselves, influenced by the nature of the rocks and rock-structures they have encountered while deepening and widening their valleys.

During the last phase of crustal movement the configuration of the surface along the northern border of the Alps appears to have been more or less strongly affected. To that phase belong the folds of the Säntis and the Jura, which betray their youth by the fact that they have experienced less erosion than other parts of the Alpine area. The comparatively well conserved character of these and many other young mountains of upheaval demonstrates that deformation of the surface by crustal movement proceeds more rapidly than general atmospheric denudation. Obviously this must be so, or the formation of tectonic mountains of the kind would be an impossibility. They would be degraded as fast as they grew. Nevertheless so potent are the agents of erosion that they have succeeded in greatly modifying even the youngest elevations of the land.

Although no portion of a growing mountain-range can escape such modifying influence, it is evident that the process of waste must be carried on most actively along lines of water-flow. As torrents, streams, and rivers cut their way down into an uprising massif, larger and larger surfaces of rock become exposed to subaerial action. The shattered débris detached from cliff and mountain-slope, slowly or more rapidly enters the drainage-system, gradually becomes reduced, and eventually is swept away as gravel, sand, and mud beyond the limits of the mountain area. In this manner profound and broad valleys are excavated, and these continue to be deepened and widened all the time that mountain-making goes on. In short, the rate of erosion keeps pace with or may even exceed the rate of rock-folding and uplift, and thus mountain-range after mountain-range may be successively sawn across by the primary rivers of a region undergoing crustal compression. The Indus, for example, has neither been dammed back nor deflected by the secondary and more recently formed ranges of the Himalaya, but has cut its way down through these mountains as fast as they rose. The same phenomenon confronts us in North Switzerland, where the Rhine traverses the young Helvetian folds on its way to the Lake of Constance. While folded mountains, therefore, cannot be developed across the valleys of active rivers, their growth outside of these valleys is not prevented by the other epigene agents of erosion, however much the latter may modify their configuration.

The valley-system of the Alps has no doubt in the course of ages become more and more complex. The protracted process of crustal deformation must from time to time have brought new streams and rivers into existence, and these would forthwith enter into competition, so to say, with others of earlier origin. Probably many rivers may at first have followed transverse or longitudinal courses more continuously than they do now. At present we see one and the same river running sometimes in a transverse, sometimes in a longitudinal direction. It is quite possible that erratic courses of the kind may sometimes have been determined by deformation of the surface, but in many cases they are probably due to the action of the rivers themselves. Some streams, owing to various circumstances, such as steeper gradient and larger volume, are more energetic workers than others in their vicinity. A transverse stream, for example, may cut its way back towards its water-parting, and eventually breach the ridge in which it rises, and thus open a way into a longitudinal valley occupying a higher level. The river in the latter may consequently be captured and diverted into a transverse course. Many captures of the kind have been effected throughout the Alpine lands, and not improbably most of the erratic courses pursued by the streams and rivers have originated in such ways. To the action of the streams must be added that of the enormous glaciers of the Ice Age, which, partly by profound erosion and partly by accumulation of morainic and fluvio-glacial materials, have produced many remarkable changes in the drainage-system of the Alps. But the further consideration of this subject is beyond the purpose of these pages. The history of the evolution of Alpine valleys would require a

volume to itself to do it justice. At present all that we are concerned with is the general denudation of the region.

When it is recognised that the existing mountains represent only a fourth or a fifth part of the original land mass, it needs but little imagination to conceive of a time when the entire region must be reduced to its base-level. Should no renewed crustal compression supervene, all that vast array of stupendous heights must gradually crumble down, and be ultimately replaced by a gently undulating plain. The process of decay, everywhere conspicuous, will go on apace until, with the gradual lowering of the surface, the rate of waste will diminish, but nevertheless degradation will never cease. The rivers and their multitudinous affluents must continue to deepen and widen their valleys, and to cut back into their watersheds, and thus the mountain-ridges that separate the valleys will gradually lose in height and width. All the beautiful lakes will disappear at an early stage. At present they form the base-levels of the drainage-areas in which they lie—they are the receptacles of the waste-materials of the mountains, and must be relatively soon silted up. Thereafter the detritus of the Alps will make its way by the great rivers to the sea, which will then have become the base-level. Slowly but surely the plain-tracks of rivers and streams will travel up the valleys—slowly but surely the heights of the land must be reduced, until the entire Alpine area is finally resolved into a rolling plain. The cycle of erosion will then be completed.

But the geological history of other mountains, and of the Alps themselves, teaches us that a cycle of erosion may be interrupted by crustal movement. The present Alps, it will be remembered, were preceded in Palæozoic times by an extensive mountain-land, which after a prolonged period of denudation sank in the sea, before it had been completely reduced, and remained submerged during the course of long ages. In other cases a mountain tract, after experiencing much erosion, has again been uplifted, and its final demolition has thus been deferred. But with renewed upheaval denudation proceeds more rapidly, for the rivers with their increased gradients regain their former greater activity, and if the uplift has been considerable the action of ice may be added to that of running water. The lowering of the land continues, and will not cease, even should occasional uplifts recur, until the region is either submerged or worn down to its base-level.

GOLD AND SILVER MINING AND REDUCTION PROCESSES AS RESPONSES TO GEOGRAPHIC CONDITIONS.[1]

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Gold and silver receive different methods of treatment varying with their occurrence and association. All through the story of their mining

[1] This paper is a portion of a thesis presented as a part of the requirement for the Ph.D. degree in Geography at Cornell University. See this *Magazine*, 1910, pp. 449-466; *Bull. Amer. Geog. Soc.* 1910, pp. 594-602, and a later number; and *Bull. Geog. Soc. Phil.* 1911, pp. 1-22, for other parts. Special thanks are given to Professors R. S. Tarr, W. F. Willcox, and H. Ries of Cornell for criticism and suggestion throughout the whole work.

in the West, the responses and adaptations to conditions have brought changes in methods of mining and handling, and have developed mechanical and technical skill and inventive genius.

Gold.

Placers.—In most localities in the Western U.S.A. and Alaska, this metal was first discovered in gravels and sands in or near stream-beds whither the streams had carried it from nearer their head-waters. There they found it in fragments formed by the disintegration of country rock containing gold in veins and ore bodies. As the rock was carried down stream it was sorted, and much of the lighter and more destructible fragments was swept entirely away, while what remained contained most of the gold. The waste left along the stream-bed was made up of rounded gravel, sand, and the fine pieces of gold, and was deposited more or less uniformly. Such auriferous deposits are called placers, and were very rich in the gulches of the Sierras and common all through the mountains. Because of the ease of detecting the metal in them they were the first forms of gold to attract attention. The process of sorting out barren rock-waste and concentrating the gold in a much smaller quantity of earth has been of inestimable value to man. He takes up the work where Nature left off, and by further concentration eliminates all but the gold.

The simplest and cheapest method of mining placer gold is that of washing the auriferous gravels in a pan or even with a shovel or in a short sluice, with water to remove the rock fragments and thus to separate the gold, which, by virtue of its greater specific gravity, remains in the pan or behind cleats on the bottom of the sluice. This method was used because it was simple and effective in the rich, unconsolidated placers, and because its apparatus was at hand or quickly made. Time in those days was gold. Its use continued because it was so effective in the high-grade gravels, and because complicated apparatus was not obtainable and was no more effective. Apparatus that would get the most gold in the shortest time and in the easiest way was the kind used. Bancroft[1] explains that these methods continued in California because the abundance and richness of the deposits lasted, and because miners were relatively few. The same law has held in many placer deposits outside of that State. Owing to these factors, when the amount of gold obtained in one gulch became too small, it was cheapest to move to a new, unoccupied one and continue the use of the simple machine. But because the continuous influx of men, attracted by the gold and the opportunities that gold-mining presented, so increased the competition; and because the crude but rapid mining so soon compassed the richest beds, less remunerative gravels had to be worked, and improved methods devised to recover more perfectly, and at a single washing, the valuable contents of the earth. The above simple processes, used at first, required little or no

[1] Bancroft, H. H., *Hist. of Calif.*, vol. vi. p. 409.

co-operation, and hence tended to develop independence of work and thought.

The less remunerative gravels were simply bars, or deserted stream-beds, which, owing to less favourable conditions for deposition, contained a lower percentage of gold; or else they were deeper down and required more labour and expense for the same return. Under the impulse of these new conditions, and in order to cheapen the process, a long sluice with more cleats to catch the gold, called a long-tom, also a hand rocker similar to an old-fashioned child's cradle with cleats across the bottom, were used. These machines, called for by the poorer gravels, required two to four men to work in a squad, but made it possible for them to produce about the same values as if working each for himself in better gravels. Royce[1] shows that the long-tom or long sluice mining meant increased responsibilities of many sorts, and so in the end made for good order. It also had a part in developing that social compact whose factors were called "pards," because of their partnership work with the machine. Then as the business was extended, longer board sluices, and finally, because the boards wore out too fast, long rock-floored ditches came into use, requiring a larger squad, and hence demanding a larger company of profit-sharers or the employment of wage-earners.

More water was needed with these larger machines used in working lower-grade gravels. When it was near, little expense arose even in the use of the more improved methods; but if the water-supply was insufficient or not permanent, capital and more costly works were necessary. In the first place, ditches or flumes were made to lead the water from external sources to points where it was needed. In the second, as much as possible had to be made of the water that was near, and it had to be so used that it could not destroy the works after storms. This co-operation and the more permanent nature of the plant for water conveyance, gave more permanence to camps, just as have river-bed mining and hydraulicking in other places.[2]

From the washing of the sand in marginal sand-bars to that of the gravel of the stream-bed was only a step. In order to reach the latter, the water had to be crowded off by a wing dam and a portion of the bed exposed. Then to get the entire river bottom the whole stream was diverted, and, to avoid the expense of dam construction, dredging with simple machines was introduced from New Zealand, where it had originated[3] and found rather general use. The dredging machinery, placed on a boat, raised the gravels from the bottom, washed them, recovering the gold, and returned them either to the water or to the land in the rear of the machine. A dredge boat was often launched in the water in an artificial pool made by excavating a hole in the bed of river alluvium, and the boat and pool advanced by digging gravel out in front and piling it in behind the machine.

[1] Royce, Josiah, *California*; in *Amer. Commonwealth Series*, 1886, p. 310.
[2] Royce, *loc. cit.*, p. 312.
[3] *Twelfth Census* (1900), *Mines and Quarries: Gold and Silver*, p. 573.

Owing to ease of handling the gravel, this method was capable of working deposits of very low grade.

Back from the stream, and usually a little above, occurred the bench gravels; and when these were found to contain ore, specially adapted methods arose to win it from them. Water was led out of the stream above the benches by a wing dam and conducted to the place in a ditch with less fall than had the stream. Then the washing began in rockers and long-toms. The workmen soon learned where to find the richest streaks in these benches or terraces and finally tunnelled for them. In Alaska, where the benches are sometimes of glacial origin, the richest streaks are differently distributed,[1] and required different treatment. Owing to climatic conditions, the gravels here are frozen most of the year, and must be thawed to be washed. At first they were thawed by building fires on them, but now this is usually done by driving pipes into them and then forcing in steam. Shafts and horizontal tunnels along rich leads are thus made.[2] Because these deposits are in a land of continuous frost, tunnels need no timbering, and shafts no pumps.

From stream gravels to beach sands was a short step, and in California many devices for working the latter have been tried and left to decay.[3] The difficulties are lack of fall for sluices, and, sometimes, lack of water. In California the Oregon tom, a short sluice, has been adopted. At Nome lack of fall declared against all sluices, and the surf against dredging. Rockers were used almost exclusively.

Still another set of conditions, the deposits of arid lands, has given rise to the process known as dry-washing or dry-blowing. In New Mexico[4] many unsuccessful attempts to utilise the wind have been made; and now a screen set obliquely and ribbed with riffles is supplied with placer material, and air is blown through the screen from behind to remove fine dirt. Coarse material is swept off with the hand, while the gold collects above the riffles. Owing to the absence of water for ordinary washing, many varieties of dry-blowing have been used in Southern California,[5] Northern Mexico,[6] and in Australia,[7] some of which were borrowed from the natives and some devised by the foreign miners; but all that were successful were adjusted to the highly specialised conditions of no water, dry dirt, suitable winds, and cheap labour.

All the above processes were used because of a special mode of occurrence of the gold—in loose, easily worked placers—and were of service only in such deposits. All were adapted to the special conditions

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[1] Kemp, J. F., *Ore Deposits*, 1900, p. 393. *U.S.G.S. Professional Paper* 15, pp. 52, 54; *Mines and Minerals*, 1900, p. 492.

[2] *U.S.G.S. Bull.* 225, 52-53.

[3] *Scientific American Supplement*, 1900, p. 20,381.

[4] *Mines and Minerals*, 1899, pp. 397-8.

[5] Bowie, A. J., *Hydraulic Mining in California*, p. 79.

[6] *Eng. and Min. Journ.* (1897), vol. lxiii. pp. 257-8.

[7] *Am. Inst. Min. Eng. Trans.* 1898, vol. xxviii. p. 490 f.; also *Eng. and Min. Journ.* vol. lxv. (1899), p. 37.

in which the gold was found. Some had been used, in principle at least, in the foreign countries from whence many of the miners had come; but their introduction and improvement in the West was a direct response to the influence of the geographic conditions in which the gold occurred, and under which the men were obliged to work.

Amalgamation.—A modification of several of the above methods greatly raised their efficiency. Mercury had been discovered in California five years prior to the gold discoveries,[1] so that its use was possible as soon as conditions made it necessary: and now small quantities were put behind the riffles in the sluices to form an amalgam with the gold and thus recover many minute fragments formerly lost. Amalgamation processes had been used in Potosi, South America, near where mercury was mined, since 1571; also to some extent in Mexico, although the long distance to its source, Huancavelica or Spain, was almost prohibitive. By taking advantage of the presence of mercury, an advantage due to the geographic distribution of mercury, the South American miners and, later, those of California greatly increased their output and cheapened their processes. In the absence of mercury Mexico must have mined in the old wasteful way or have paid heavily for imported mercury.

Hydraulicking.—Men continued to come into the gulches and valleys, and the gravels and sands were becoming exhausted; hence prospectors and miners pushed farther up the streams to find new or better deposits, and, in 1851, discovered the fossil stream-beds high up on table mountains. The gravels and sands of these beds were stream-laid ages ago, and then overlaid with lava. Subsequent erosion had cut these deposits—lava, gravel, and sand—in two and removed a part of the gold-bearing beds, and after sorting and rewashing the gravels, and concentrating the gold, transferred them to the present valley floors. The remaining portions were rich and extensive, but could not be worked in the ordinary ways. The lava cover prevented beginning at the top. Most of the gold was at the bottom of the channels, and to get it required either moving the entire filling, or the construction of tunnels and the removal of the pay gravel. Tunnelling was expensive because continuous timbering was necessary. Then no water was near for washing. To develop these supplies of gold required capital and labour, and here began the first extensive systematic hired mining.[2] An adaptation of the long-tom sluicing with men shovelling gravel into the feed boxes was the initial device. In 1852, a man desirous of economising labour made a raw-hide hose and with water under head washed gravel into his sluice. His neighbours followed, and then improved by using first canvas hose, stove pipe, sheet-iron, and then heavy wrought-iron flumes, thirty inches in diameter and furnished with an elaborate nozzle. Some of these flumes were thousands of feet long,[3] and being connected with ditches or tunnels 10-100 miles long,[4] led water in large quantities from some higher level, often from beyond a divide, down to the partially cemented gravels with such

[1] Hubbard, G. D., *Bull. Geog. Soc. Phil.* (1911), vol. ix. p. 7.
[2] Bowie, A. J., *Hydraulic Mining in California* (1885), p. 48.
[3] Bowie, A. J., *loc. cit.* p. 49 f. [4] Eissler, Manuel, *Metallurgy of Gold* (1900), p. 51.

force as to tear them down and break them to pieces and then wash them into long sluices. Here their gold contents were sorted and caught in mercury behind the riffles. Sometimes the gravel was so firmly cemented that dynamite was exploded to aid the water in breaking it down. This new, elaborate process, called hydraulicking, could not be used successfully in other kinds of deposits, but was ultimately closely adapted to the requirements of these ancient gravels. Thus the cost of handling the gravel was reduced from dollars per cubic yard in the rockers of 1848 and 1849, first to $.35 in the long sluices, and then to half a cent in the hydraulicking process. Those who had resisted the temptation to spend all as fast as it was acquired usually became the capitalists in this new form of co-operation, while those who had wasted all, or who had been the victims of hard luck, became the labourers or withdrew to other occupations.[1]

Placers of Sierras and Rockies Contrasted.—Much the larger proportion of the placer-mining in the West per unit area has been in California. The Cretaceous rocks of the Sierras with their ledges of free milling ores, disintegrated into good placers with gold of a high degree of purity; but the propylitic rocks of the Rockies with their complex associations have not furnished so much placer gold nor such good quality as that in California. This geographic distribution of placers and their parent rock has had a beneficent influence on the development of the mining industry of the West. The native gold or gold in simple associations was found first, and where it could be easily worked, hence the industry flourished from the start. Had the two kinds of bed-rock deposits exchanged places, it would not have been so easy to find the first placers; and if the Eastern placers had been found first, they would hardly have been able to furnish capital for the later development of veins and lodes. And had the Sierra kind occurred in Western Colorado and Idaho, many of the hardships incident to reaching and developing the region would have been increased. Neither men nor provisions could have reached the place by sea. The long land journey from the East would remain, although much shortened, but there would have been added to the sea route a long difficult land route, from the coast far inland.

Vein Mining.—As gravels became exhausted, prospectors, followed by miners, pushed on up the ravines and discovered the quartz veins from which the gravel had come: and then there arose a different kind of mining. In these auriferous ledges as found in most of the Western States and even in the Southern Appalachians, the gold was intimately associated with other minerals, and the whole mass had to be broken out of the country rock and crushed before the precious metal could really be claimed. This required time, expensive machinery, mechanical skill, and withal a deal of adjustment to the conditions in order to operate the mines successfully. But, as shown above, capital was not wanting, and experiments began. By a normal process of selection a method of mining and reduction was perfected, but not until many fortunes had become exhausted and companies dissolved. Beside the exhaustion of the richer

[1] Bancroft, H. H., *Hist. of Calif.*, vol. vi. pp. 416, 418.

placers, another factor aided in the development of the quartz-mining. Hydraulic mining, discussed above, had been entered into by multitudes. By 1858, in California alone, six thousand miles of water-ditches had been built. About this time the waste from hydraulicking began to interfere with agricultural interests, and by 1884 the interference had advanced to such an extent that prohibitive legislation checked its further operations,[1] and capital and enthusiasm turned to quartz-mining, thus still more increasing the latter form which had now become well developed.

In the early days of quartz-mining the ore was crushed by stamps or rollers, and the rock flour washed as in the placer works. This process in its most perfect state did not save all the gold, so others were devised to meet the difficult combinations presented by the ores. A method known as the chlorination process has now come to be used extensively. The crushed ore before or after concentration, and sometimes after roasting, is treated with chlorine gas, which forms chloride of gold, soluble in water and removed by washing. From this solution the gold is easily recovered by precipitation with iron sulphate. Stamp mills customarily accompany chlorination plants, and smelting works are sometimes associated to handle special ores. This process is especially adapted to rather high-grade ores and those practically free from iron. A second chemical method probably more used than the above is known as the cyanide process, and is most serviceable in the treatment of low-grade ores. It finds its special field in the reduction of ore carrying iron and copper sulphides. The crushed ore in a "slime" condition is treated with a strong solution of potassium cyanide, usually strongly aerated, and the gold is thus brought into solution and separated from its refractory native compounds. Furnaces often follow the cyanide tanks, where with suitable fluxes the reduction to metallic gold of specially rebellious ores, by means of chemical reactions requiring heat, is effected. Had the ore occurred in small or more scattered deposits, even these processes would probably fail to extract the metal economically: but since large quantities of ore, even though of low grade, can be obtained within a limited area and be treated simultaneously, the expensive plant with its trained men, technical skill, valuable apparatus, altogether a costly equipment, can be operated at a profit. Illustrations of the failure of extensive plants to remain in operation are common: and usually they go out of business because the deposits are not as large as supposed, or because their contents are found to change character in the course of development, or because some resource, water, fuel or timber, has failed.

As already shown, the geographic conditions favoured the great development of placer-mining in the early days and called for little development of bed-rock ores. Table I. shows that there has occurred a great change since 1880 in the relative importance of quartz and gravel as sources of gold. In the early days of California and of most of the other States and Territories, including the Carolinas, Georgia, and even Alaska, a very large percentage of the metal came from gravels. No

[1] Hubbard, G. D., *Bull. Geog. Soc. Phil.*, vol. ix. (1911), pp. 14-15.

reliable statistics on this point dating back farther than 1880 have been found. In 1905 only 17 per cent. of the total gold production came from gravel. Alaska, the youngest gold producer, supplied over one-half of that amount, and she is also the only one with more than a handful in its total production that recovered more metal from gravel than from quartz. Owing to increased Alaskan placer-mining during 1906 and 1907 the total percentage of placer gold has gone up during these two years. Alaska is still in the placer stage of her gold-mining. If this territory with its relatively large placer production be taken out of the figures in Table I., the change in the source of gold will become much more apparent. This change occurred partly because the placers were insufficient to employ the men who had been attracted by them, partly because the placers were becoming exhausted, and there was no other mining but quartz to which the men might turn. The wealth accumulated from the early forms of mining was ready to go into the more expensive and complex processes, and the conditions required it.

TABLE I.—DISTRIBUTION OF GOLD AND SILVER AS TO SOURCES OF PRODUCTION.

	GOLD (Fine Ounces).		SILVER (Fine Ounces).		
Year.	Quartz.	Placer.	Quartz Ores.	Lead Ores (*b*).	Copper Ores.
1907	3,034,609	1,192,890	19,038,042	19,038,449	14,200,348
1906	3,374,639	1,328,361	16,792,799	21,011,464	19,288,709
1905	3,568,724	697,018	13,990,008	25,147,252	16,964,340
1904	3,245,097	647,383	15,113,401	26,973,843	15,595,556
1903	3,062,762	591,219	16,835,528	25,682,882	13,844,232
1902	3,315,717	597,964	16,988,647	28,035,620	12,812,291
1901	3,243,248	609,974	16,064,208	27,018,344	14,790,934
1900	3,269,794	597,850	16,496,711	30,593,763	13,121,912
1899	3,062,286	450,958	15,861,230	29,000,609	11,859,334
1898	2,812,579	372,215	13,716,882	31,312,676	10,457,275
1897	2,525,387	390,858	12,233,429 (*c*)	32,244,341	11,637,395
1893	...	...	27,641,100 (*c*)	24,713,100	7,645,800
1880[1]	1,741,654	580,478 (*a*)	...	...	...

(*a*) Excluding Alaska with 288 ounces.

(*b*) Colorado lead and copper ores, amounting to about one-half of this item each year, are not divided but are placed under lead together.

(*c*) Quartz and free milling ores combined.

Methods that are used with some kinds of ore are worthless in the treatment of others, and processes profitable under certain conditions would cease to be remunerative under others. In each locality a method of extraction and reduction capable of handling the ore in its mineral associations, and also adapted to the conditions of water, fuel, and transportation, must be devised. Because of the relation of mining and

[1] *Twelfth Census* (1900), *Mines and Quarries: Gold and Silver*, p. 547.

reduction processes to the vicinal geographic conditions, the latter may seem in cases to control the output; and so they do. But herein occurs an excellent measure of the influence of the metals. They are sometimes able to combat and overcome very gigantic obstacles. Many shaft and tunnel mines in California successfully met the conditions, because in the midst of timber. Had they with the same gold values been located in places where timber is so scarce as around some working surface mines in Arizona, New Mexico, or Nevada, the output of the mines could not have borne the expense because of their moderate values. But many mines in these more arid, forestless States are so rich that they can sustain the long timber hauls, the struggle (and often great expense) to obtain water, the difficulties of costly transportation, or the flooding of the mines with water, and have prospered for years against the heavy odds. The almost fabulous wealth or other special advantage of certain districts has enabled them to surmount the greatest obstacles and to produce enormous quantities of the precious metals. The Comstock[1] lode mines suffered because of excessive heat and of flooding with underground water, as well as through being in a desert with nothing near that was needed.

The Treadwell[2] mines on Douglas Island, Alaska, situated on a very low-grade ore body, in high latitude, and one thousand miles from Seattle, are able to run very satisfactorily because of abundance of water, sufficient water-power during the seven open months, plenty of fuel, cheap sea transportation, ore fairly uniform, constant as depth increases, abundant, and easily gotten out of the ground; and again easily reduced, because a large part of the values can be recovered by amalgamation. The average cost of operation here for nine years was $1.73 per ton, and the yield $2.18 per ton.[3] It is in the ability of these gold deposits to overcome such enormous difficulties that their influence is most clearly manifested.

Effects on Scenery.—The influence of some of the above processes on the surrounding features, landscape, forest, and stream, is very appreciable. Gulches once as beautiful as a picture have been dug over, washed out and refilled with débris, upon which vegetation has not yet obtained a footing. In many places desolation is the only word. Scarred hillsides and pillaged ravines are seen at almost every turn in extensive mining regions. Of course gold-mining is not very different from other mining in this respect, but the speed with which ends have been reached and destruction wrought will compare favourably with any other mining operation. The early California days, however,[4] did not witness damaged forests except where these were cut for building houses (rare structures at first), because timber was not needed to support tunnels and shafts so long as placer-mining continued; but later the axe worked havoc, gathering material to timber the shafts and tunnels in the quartz seams and to build mills, roads, and railroads. The same sequence may be

[1] *U.S.G.S. Monog.* iv., pp. 56 f., 389 f.

[2] *U.S.G.S. Bull.* 225, pp. 28, 42.

[3] *Twelfth Census* (1900), *Mines and Quarries: Gold and Silver.*

[4] Bancroft, H. H., *History of California*, vol. vi. p. 416.

noted in many places in other States. Where smelters producing noxious fumes are being used, their influence on the vegetation is appalling. It is stated[1] that there are no trees in Butte and Anaconda, Montana, although formerly there were plenty. Sulphurous acid gas is produced by roasting sulphide ores, and this gas is destructive to vegetation. It is also a disinfectant, killing disease germs. Through special efforts recently to check the nuisance, its destructiveness had been so reduced that a few small gardens and some house plants are now growing.[2]

(To be continued.)

THE VEDDAS.[3]

It is to Robert Knox[4] that we owe the first accurate description of the Vedda and his surroundings. Long before Knox's day strange stories had been told by Chinese and Arabian merchantmen of their intercourse with the genii and demons of Ceylon, who, when the season for traffic arrived, "appeared not but set out their precious commodities marked with the exact price: if these suited the merchants, they paid the price and took the goods."[5] There can be but little doubt that these early notices refer to the Veddas, who practised, if they do not now practise, this curious mode of trading. But it was Knox who was the first to supply in some detail trustworthy information in regard to this primitive people. His account has been amplified and supplemented by many later writers, and of these the most important are Bailey,[6] Nevill,[7] the Sarasins,[8] and the authors of the work under review.

There are three questions regarding the Veddas which are of special interest. Firstly, what were their characteristics when untouched by civilisation? Secondly, to what other races are they related? And, thirdly, what is their present condition? As regards the first question it may be said that Dr. and Mrs. Seligmann have set forth clearly and distinctly all that is known from early notices of the Vedda in a state of nature, and that, as regards the third question, they have made valuable additions to our knowledge of his present condition. With the second question they have hardly concerned themselves, and yet it is one which

[1] Correspondence with H. V. Winchell, April 1905.

[2] Correspondence with W. H. Weed, March 1905.

[3] *The Veddas*, by C. G. Seligmann, M.D., Lecturer in Ethnology in the University of London, and Brenda Z. Seligmann; with a chapter by C. E. Myers, M.D., D.Sc., and an appendix by A. Mendis Gunasekara, Mudeliar. Cambridge: At the University Press, 1911. Price 15s. net.

[4] *An Historical Relation of the Island of Ceylon in the East Indies.* London, 1681.

[5] *Pilgrimage of Fa Hian*, from the French edition of the Foe Koui Ki of Remusat, Klaproth, and Landresse (Calcutta, 1842), p. 332.

[6] *An Account of the Wild Tribes of the Veddahs of Ceylon.* (Trans. of the Ethnological Society, New Series, London, 1862, ii.)

[7] *The Taprobanian*, 1886, vol. i.

[8] *Ergebnisse Naturwissenschaftlicher Forschungen auf Ceylon in d. Jahren* 1884-86. Wiesbaden, 1903.

suggests problems of the greatest interest to all students of the early history and primitive institutions of mankind. It has been contended[1] that the Senoi of Malacca, the Toala of Celebes, and the Kubu of Sumatra, sprang originally from a Vedda stock, and this contention has been supported by a reference not only to the wavy hair, small stature, form of face, and other structural peculiarities, which mark all these peoples, but to the habits of life and modes of thought which they have in common, *e.g.* to their monogamy, their intense aversion to strangers, and their curious mode of trading. If this contention be sound, it would seem to follow that monogamy and the silent trade were practised by the parent stock of these peoples,—a fact which, if established, would go far to show that these practices belong to a very early stage of social development. Our authors content themselves with stating their belief that the Veddas are part of the same race as the so-called Dravidian jungle tribes of Southern India.

The "wild" Vedda has come to be regarded as one of the sights of Ceylon, and some half-cultured specimens of the race have found it profitable to pose as the unsophisticated savage for the benefit of the curious traveller. On being apprised by their friends of the white man's approach, they make their appearance clad in scanty loin cloths and smeared with ashes, affecting a sullen demeanour and grunting their replies to the seeker after truth. But when they are not engaged in playing the primitive man, they wear the ordinary dress of the Sinhalese.

Our authors received from a Kandyan, who was said to be nearly one hundred years old, some interesting particulars regarding the "wild" and "village" Veddas of his early days. At that time the "wild" Veddas built no houses, but lived entirely in caves. Near the caves, but out of sight of them, were trading places (*wadia*) situated under a tree or rock. On coming to barter, the stranger stopped and shouted and waited, until an answering shout came from the caves. The silent trade was then only a tradition among the wildest Veddas, and had probably ceased for at least two generations.[2] One of the most curious customs of which the old man spoke—a custom said to be still universally prevalent—was that of keeping in the betel-pouch a piece of human liver. This article was obtained by killing a stranger or even a Vedda, if the latter were caught trespassing on a hunting-ground where he had no right to be. The same informant stated that the wilder Veddas used no numerals beyond one.

Perhaps the most interesting chapters of this interesting book are

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[1] F. Sarasin, *Les Types humains inférieurs du Sud-Est de l'Asie* (Revue Générale des Sciences, 19e Année, No. 8, Paris, 1908); B. Hagen, *Die Orang Kubu auf Sumatra*, Frankfurt a. M., 1908; Schmidt, *Die Stellung d. Pygmäenvölker in d. Entwicklungsgeschichte d. Menschen*, Stuttgart, 1910.

[2] Bailey (*op. cit.* p. 285) says that in his day the silent trade was no longer practised. C. S. V. Stevens (*Amongst the Veddas*, Royal Asiatic Society: Ceylon branch: Proceedings, 1886, p. 108) affirms that it is still in operation. The Sarasins (*op. cit.* iii. p. 557) were informed to the same effect. Dr. and Mrs. Seligmann state (p. 15 note) that Stevens' paper "must be regarded as absolutely misleading."

those which describe the family life of the forest Vedda of to-day, his notions of property, his social organisation and his religion. During the dry months he takes up his abode, along with his wife and children, his aged parents and his crippled relatives, in a hut close to some watering-place. It is there, in the forest, near the half-dry river-courses, that the game collect. But when the rains come and the game seek the high ground, the Vedda follows them; and it is then that he makes a rock-shelter his home. Where several families inhabit a single cave, each has its clearly defined place, within the limits of which its members are bound to confine themselves. The Vedda is strictly monogamous, and guards his women with watchful jealousy. In marrying, he is careful, if he study the proprieties, to choose as his wife the daughter of his father's sister. A man scrupulously avoids his mother-in-law, and the wives of his son and brother. Indeed he may not utter their names, but must use instead the appropriate terms of relationship. On the other hand his father-in-law is more to him than his father and brother. He hunts with him and gives him the largest share of the game he has killed; while the father-in-law often gives the son-in-law a tract of land as a marriage portion. The Veddas of to-day are organised into clans (*waruge*). Exogamy prevails in Bintenne and Tamankaduwa, and descent is matrilinear; but, in some of the other districts, marriage takes place freely within the clan. Adoption is not practised. The territory of each group includes the whole or part of a considerable hill or rock. The Vedda has a strong sense of ownership as regards both the hunting-ground of his group and his own individual possessions,—his axe, his bow and arrows, his pots and gourd and betel-pouch, his flint and steel, and—most treasured of all—his dog. It is to be observed that within the group's hunting-ground are the private hunting-grounds of individuals. Land is commonly divided upon the owner's death among his children, but no land can be transferred without the consent of the adult males of the group. It is interesting to observe that the symbol of such a transfer is a stone given to the new owner. Sometimes a tooth, a lock of hair, and a metal strike-a-light are added. The Vedda knows the boundaries; and where there is no natural landmark, he cuts the figure of man with a strung bow on the tree trunks along the dividing line.

The Vedda religion is "essentially a cult of the dead, and . . . the propitiation of the spirits of dead relatives, called the *Nae Yaku*, is at once its most obvious and important feature." These *Yaku* (singular *Yaka*, feminine *Yakini*), if well treated, act towards the survivors as kindly friends; but, if neglected, they either withdraw their aid or become actively hostile. In each community there is a personage, whom our authors have called "the shaman," whose duty it is to call the *yaka* to whom an offering is being presented, and to invite him to partake of it. The form of invocation is the same in all Vedda ceremonies. The shaman sings the words while he dances slowly round the offering. Sometimes the bystanders take part in the singing. The dance grows quicker and quicker; the voice of the shaman grows hoarser. At last, he is possessed by the spirit and becomes its mouth-piece; and, in his husky accents, it declares its acceptance of the sacrifice, and its promise

of assistance in the chase. When the spirit has gone out of the shaman, all present partake of the offering,—an act of communion essential to secure the practical benefits of the ceremony. On such an occasion it is the usual practice to invoke not only the *Nae Yaku*, but the spirits of Kande Yaka, the mighty hunter, and Bilindi Yaka his brother. To the former the *Nae Yaku* resort in order to receive authority to accept offerings and to obtain power to benefit or injure.

Our authors suggest that Vedda belief may be said to consist of three strata—Firstly, there is the cult of the dead, including not only the spirits of the *Nae Yaku*, but those of Veddas long since dead, such as Kande Yaka and his brother. Secondly, there is the cult of foreign spirits, who have become naturalised, and have assumed the friendly character of the Vedda *yaku*. And thirdly, there is the cult of foreign spirits who have retained their foreign character, and are, in the main, terrible or even hostile. It is this stratum which is dominant among the "village" Veddas.

The magic of the Veddas, their ceremonial dances, their invocations, their arts and crafts, their music, songs and language, form the subject of interesting and instructive chapters. Excellent reproductions of Dr. Seligmann's photographs form a valuable and attractive feature of the book; and a map and serviceable index are of material assistance to the student.

Erratum.—Mr. C. R. Dryer, of the Indiana State Normal School, Terre Haute, Indiana, draws our attention to a misprint on p. 295 (June issue), where in Mr. V. Dingelstedt's article on "Ruling Nations" it is stated that "about 42 per cent. of Americans are of coloured races." According to the census of 1900 about 12 per cent. of the inhabitants of the United States are negroes, and the numbers of Indians, Chinese, etc., is relatively trifling.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Revision of Laws.

A Meeting of the Society was held in the Society's Rooms on Tuesday, the 11th of July, when the proposed amended constitution and laws, as set forth in the pamphlet circulated among the members, with the amendments passed at the Meeting of Council held on the 6th June, were adopted.

Diploma of Fellowship.

The Ordinary Diploma of Fellowship was conferred by the Council on Dr. J. Ewing Hunter subject to his compliance with the prescribed conditions.

GEOGRAPHICAL NOTES.

Europe.

Distribution of the Vine in France.—An article by Antoine de Saporta with this title in the *Revue Générale des Sciences* for May 15, gives some interesting facts in regard to this subject. It is illustrated by a map which shows very clearly the irregular distribution of vineyards in France. The author believes that the present distribution is determined chiefly by economic causes. In the early days, when communications were very primitive, the vine was grown wherever the conditions permitted, even if the resulting wine was bad, because of the difficulties of transport. This condition has now passed away with the great development of roads, canals, railways, and so forth, and further, where the conditions make the local product inferior, or the cost of transport considerable, then beer, especially near the Belgian frontier, and cider, especially in Normandy and Brittany, compete so strongly as beverages that the vineyards are crowded out. Further, at the period when phylloxera raged, and when it was found that American stocks were resistant, great difficulties were experienced in establishing these on certain types of soil, especially on calcareous soil. This gave the regions whose soils were fitted to the American plants a temporary advantage, even though the soils themselves were not well fitted to produce wines of high quality. Later the difficulties in establishing the American plants were got over, and a readjustment took place. On the whole, then, at the present time it is the economic factor which is the decisive one. But as small differences of elevation, of exposure, and so forth, affect the product enormously, the distribution shows curious irregularities, specially marked where the plant is near its natural limit, *i.e.* towards the north, or on mountain-sides. Several examples of this are given. Thus it is noted that the vine ascends high up the Alps, and enormous stretches of vineyards may be seen round Geneva, with its "continental" climate. On the other hand, in the Pyrenees, which are exposed to oceanic influences, even a slight elevation above sea-level, *e.g.* 650-1000 feet, is sufficient to eliminate the vine. But this is not all. There is, for example, a very marked difference, as regards the number of vineyards, between Lower Languedoc, which is practically "monocultural," and Provence, where fodder plants, fruits, early vegetables, even wheat, compete strongly with the vine. Here no difference of climate can be invoked to explain the difference in products. The difference is of long standing, and the author believes that it has an economic basis. Thus he points out that the streams which flow from the Cevennes, the Corbières, and the Mediterranean slopes of the Pyrenees are too irregular in their flow to be used for irrigation, while the Lower Rhone, and especially the Durance, swollen in summer by glacial water, moisten the adjacent lands to a great height, and render possible a greater variety of crops.

Africa.

Isotherms for Africa.—We have received a reprint of an article with this title contributed by Mr. J. Craig to the *Cairo Scientific Journal* for May of the present year. The article is accompanied by two charts, showing isotherms for the continent of Africa for January and July respectively. These charts are to appear in a school atlas to be published in Arabic for use in the schools of the Ministry of Education, and have the interest that they are based not only upon material hitherto available, but also upon observations made in and near the Basin of the Nile, and collected by the Survey Department. All temperatures are reduced to sea-level, and while in the damp equatorial zone the temperature gradient has been taken as -0° C. per 100 metres, in the drier region of North Africa a gradient of -1° C. per 100 metres has been adopted.

The points of interest shown by the charts are given by the author as three in number: (1) The Mediterranean has a warming effect in winter and a cooling one in summer; (2) The Benguela current exercises a cooling effect on the south-west coast both in summer and winter; (3) The summer temperatures are excessive (over 93° F.) in the North Sudan and in the interior of South Africa, making these two regions among the warmest in the globe. As, however, the North Sudan is at a lower altitude than the interior of South Africa, the actual temperatures recorded in the former place are higher than in the latter.

America.

The Treelessness of the American Prairies.—Mr. B. Shimek contributes to the *Bulletin* from the Laboratories of Natural History of the State University of Iowa (vi. 1911) an interesting article on this subject, based especially upon a study of the conditions in the State of Iowa. In that State the treeless prairie with its abundant grass and flowers formerly covered more than seven-eighths of the total surface, leaving less than one-eighth for the forest area. The plant formation characteristic of the prairie occurred in regions of very varied topography, from the flattest to the most broken. It occurred also on all sorts of soils. These statements are true not only for Iowa but also for other parts of the Mississippi valley. Further, the plants of the prairie are quite distinct from the smaller plants of the forest areas, and constitute a well-marked formation. The author gives detailed lists of the species, and points out to what a small extent any intermingling of the floras occurs.

As soil and topography are excluded as direct causes of the treelessness, it is necessary to look for the cause of this in the atmospheric conditions. In the first place, it is to be noted that places clothed in the prairie flora are places exposed to very rapid evaporation, especially at certain seasons of the year. The maximum heat of the day is reached at about 2 o'clock p.m., and is greatest on flat surfaces and those with a southerly slope. The prevailing winds of summer are from the south or south-west, and affect equally flat areas and those with a south-westerly

slope. The result is that all surfaces so exposed are covered by the xerophytic prairie flora, while a dip of the surface, or the protection of a ridge, may cause trees or a modified mesophytic flora to appear. A detailed study of the rate of evaporation showed that it was much more rapid in the regions clothed with the prairie flora than in those where forest was present. Study of the rainfall records shows that it is not the total rainfall which determines the presence or absence of trees. "The prairie areas are uniformly so situated that they are fully exposed to the factors which cause rapid evaporation, namely the sun and the wind. During much of the year they may present conditions quite favourable to plant growth, but there are seasons and there are portions of the year, especially in midsummer, when evaporation and consequent desiccation become so extreme that only those plants which are especially adapted to dry regions can survive. The more or less frequent recurrence of such periods, which are fatal to the mesophytes of the forest, is sufficient to wipe out, or rather prevent, the development of a forest flora on those surfaces which are most exposed to evaporation. Forest trees are perennial and must exist through all the varying conditions of succeeding seasons. Any period, no matter how short, which is fatal to trees is sufficient to prevent the development of a forest even though the greater part of each season is favourable to tree-growth, and the failure of the trees of course results in the failure of the minor forest flora, which in our territory is essentially mesophytic."

This conclusion is important because it explains the puzzling fact that forest and prairie occur close beside each other, even on the opposite sides of the same ridge, where obviously the rainfall must be the same, though the conditions affecting evaporation may differ. It helps to explain also how it is that trees will grow on the prairie when planted, for man can give in various ways the slight shelter necessary to turn the balance in the favour of the trees. It is remarkable that in tree-planting groves and groups of trees are much more successful than rows; in the former case, though the marginal trees may not thrive, they give some shelter to the enclosed trees. The author concludes by considering the other causes of the treelessness of the prairies which have been suggested by various authors, such as prairie fires, the former abundance of the bison, and so on, and comes to the conclusion that none of them is of much importance.

The Plateaux of Tropical America.—Professor J. Russell Smith, of the University of Pennsylvania, read a suggestive paper before the Eighth International Geographical Congress in 1904 on the Economic Importance of the Plateaux in Tropical America. This paper he has recently revised and expanded for publication in the *Bulletin* of the American Geographical Society. The gist of the paper is that, in marked contrast to the conditions which obtain in the Old World, and also in the temperate parts of the New World where the plains are the densely peopled regions, tropical America is practically peopled and civilised only in its plateau regions. Each of the divisions of central and tropical South America is examined separately with the object of

proving this thesis. We need not follow this examination in detail; it is sufficient to note that the position of the State capitals everywhere illustrates the fact that population avoids the malarious, forest-covered lowlands, to crowd upon the plateaux where the climatic conditions are more favourable, and where minerals are often abundant. Whereas elsewhere the important cities are placed on plains, and are frequently seaports, in the eleven independent States of tropical America only one, Brazil, has a capital which is a seaport. Even here the real administrative centre is the suburb Petropolis, placed on the escarpment of the plateau. The fact that the important cities are not ports has a curious secondary effect. Elsewhere ports usually become industrial cities, the industries sometimes supporting a larger proportion of the population than commerce. But in tropical America the commercial port is always separate from the industrial city, and is often situated at a considerable distance from it. The consequent difficulty of communications is a great handicap to industry. A very curious case is that of the Brazilian port Santos, which is the first coffee port in the world, and has a population of 20,000. Above it, on the plateau, lies Sao Paulo, with a population of 200,000, an important industrial town. The net result is that in tropical America the most fertile land, and the land which is adapted for the growth of the definitely tropical products—for the plateau regions often yield temperate products—lies as yet largely unused, and imperfectly organised. The tropical diseases have hitherto offered an almost insuperable barrier to progress here, but these are being conquered. When their conquest is completed these fertile lands will offer an enormous field for exploitation, and Professor Russell believes that it is here that the overcrowded millions of India and China should find room to overflow, and that with adequate organisation and scientific tropical agriculture, these lands will produce abundantly those tropical products of which the world stands in need.

Polar.

Distribution of Land in Arctic Regions.—The Coast and Geodetic Survey of the United States has published under the title of *Arctic Tides*, by Rollin A. Harris, a summarised account of the tides of the Arctic Ocean, based upon the observations of Commander Peary, and also of Messrs. Mikkelsen and Leffingwell at Flaxman Island, off the coast of Alaska. Without entering into details of the tides, it may be noted that the author considers that the evidence goes to suggest that a large area, covering about half a million square miles, and lying between Alaska and the Pole, is only slightly submerged, and thus forms either land or shoals. The way in which the tidal wave is propagated seems to contradict entirely the supposition that a deep and uninterrupted ocean separates Alaska from the polar sea. The author even gives a suggested shape for this land area, which he represents as trapezoidal. This supposed area is indicated on a map, for, apart from the tidal observations, some of Peary's soundings, and the position of his Crocker Land, afford hints as to its probable shape.

In connection with the same subject, it is interesting to note that two members of Commander Peary's last expedition, Prof. D. B. MacMillan and Mr. Geo. Borup, propose to undertake an Arctic expedition next year, with the object of exploring Crocker Land. This region was sighted by Peary in 1906 from Grant Land, but was only seen at a great distance, and its shape and characters are quite unknown.

General.

Causes of Formation of Laterite.—It is a familiar geographical fact that in tropical countries the surface is often covered with the red earth called laterite, which forms a thick mantle. Its origin has been the subject of many investigations, and it is now generally accepted that it is simply produced by the decomposition of the underlying rocks, this decomposition taking place under special conditions. In a note in *La Géographie* for April 15 last, M. Paul Lemoine discusses the interesting question as to the exact nature of these conditions, basing his remarks upon his own researches, and upon a recent paper by Mr. J. B. Harrison in the *Geological Magazine* (vol. vii.). Mr. Harrison gives reasons for believing that laterite is the product of decomposition, owing to atmospheric agents, of igneous or metamorphic rocks. The question of most geographical interest, however, is why the particular decompositions concerned should only occur in hot and damp countries, to which laterite is generally stated to be limited. The cause usually given is the alternate occurrence of wet and dry seasons in these countries, but Mr. Harrison shows that in British Guiana, the country whose red earths were studied by him, perpetual humidity reigns in the forests where laterite occurs, and that clays, frequent in temperate countries, also occur there as a result of the decomposition of the rocks. The immediate cause of the production of laterite or of clay appears to be the nature of the rock. Rocks with plagioclase felspars and abundant ferro-magnesian minerals give rise to laterite, those containing alkaline felspars give rise to clays.

If this be true, there seems no apparent reason why laterite should not occur in cold countries as well as hot ones. Why then has it never been observed in the former? The explanation is apparently to be found in the tendency of the laterite to become hard. The causation of the hardening process is obscure, but it is probably due to changes in the degree of hydration of the oxides of iron and aluminium, as well as to progressive modification of the alumina and of certain silicates which pass from the soluble colloid condition to the insoluble one. The deposition of hydrates of iron is also a factor. The hardening is sufficient to preserve the laterite in hot countries, but in cold countries the deposits are exposed to the action of frost which pulverises them, and so permits the particles to be carried away as they form. In other words, it is not the heat of tropical countries which permits the formation of deposits of laterite; it is the absence of cold there. If this hypothesis be well founded, then at least minute traces of laterite should be discoverable in cold countries. These should now be sought.

In this connection it is interesting to note that the characteristic

desert varnish (*vernis du désert*), found on the grits of desert regions, has been proved to exist also in minute traces on grits elsewhere, notably on those of the Vosges. This varnish is due to the evaporation at the surface of water taken up by the rocks and subsequently exuded, which leaves behind a film of salts as it evaporates. The varnish is not confined to desert regions, but it finds there the conditions necessary for its conservation, and the same may be true of laterite in hot countries.

The Possibility of Climatic Change.—An article by Mr. Geo. Reeder in the *Monthly Weather Review* for Dec. 1910 gives an interesting discussion of the perennial problem as to whether climatic changes are going on at the present time. The particular instance is the question whether the springs of the United States are growing colder. Spring frosts in various parts of the States have been very frequent of late years, and have led to disastrous results from the point of view of agriculture. This is especially the case in Missouri, where the fruit-growers are contemplating the giving up of their orchards because of a succession of cold springs which have destroyed the blossom. They assert that the climate is certainly growing colder. The author points out that from the fruit-grower's point of view it is the daily minimum, not the mean daily temperature, which is the important point. In the State of Missouri he finds evidence to show that for the last ten years, and particularly for the last five, the minimum spring temperatures have been lower than in the preceding fifteen years. This is not only true generally for the months of April and May, but in particular frost has been more frequent than formerly. Unfortunately data for long periods are not available, but there is every reason to believe that the figures indicate merely cyclical changes, "oscillations in the weather rather than changes in the climate." The agriculturist obviously wants to know the probable length of the cycle, in order that he may calculate the chances of success in raising fruit on a large commercial scale over a number of years, but this is just the point about which meantime the meteorologist can give him no information. The point is interesting as showing the value of detailed meteorological observations.

The British Association.—As already announced here the annual meeting of the British Association will take place at Portsmouth, beginning on Wednesday, August 30, under the presidentship of Sir William Ramsay. The president of Section E (Geography) is Colonel C. F. Close, R.E., who will discuss in his opening address the purpose and position of geography with special reference to its relations to other subjects, and also give an account of the various ways in which the Government Departments have assisted the cause of geography, notably in the matter of mapping the Empire. As regards the work of the section generally, an attempt has been made to arrange mainly for the discussion of a few subjects illustrating the "advancement" of geographical science, rather than for a multitude of separate papers. The way in which geography enters into every sphere of expanding activity will be demonstrated in a discussion on "The Airman's Require-

ments," which it is hoped will be opened by Captain Bertram Dickson. Others expected to take part in this discussion are Captain Broke-Smith, of the Army Air Battalion; Mr. Eric H. Clift, Captain H. F. Wood, Captain Archibald R. Low, and Captain F. A. Sykes. A number of papers will relate to the sea. Mr. A. R. Hinks has promised a paper on the Shape of the Sea Surface; M. Ed. Henrici another on Mean Sea Level; Professor C. Pettersson will report the results of some Recent Experiments on the Tidal Movements of the Deep Water of the Kattegat, and Dr. Gustav Ekman will describe some Experiments with Automatic Current Measurements in the Open Sea. There will be a joint meeting with the geologists and botanists for the consideration of the relation of the present plant population of the British Isles to the Glacial Period, and probably another joint meeting with the geologists to discuss the former connection of the Isle of Wight with the mainland. Among various other contributions will be a lecture by Captain C. G. Rawling of the British Expedition to Dutch New Guinea, and a paper on the Mapping of Thermal Regions by Professor A. J. Herbertson.

As we have published here a considerable number of papers dealing with plant-geography, it is interesting to note that in the Botanical section there is to be a discussion on the Principles of Construction of Phytogeographical Maps, which will probably be opened by Mr. A. G. Tansley. Additional interest will be lent to this discussion by the presence of a number of the most eminent Continental and American plant geographers, who will be in England during August for an "International Phytogeographical Excursion to the British Isles." As the neighbourhood of Portsmouth offers many attractions from the point of view of plant geography, excursions will play an important part in the programme of the botanical section.

An attractive series of social functions is being arranged, including a garden party and reception, and an evening fête by the Mayor of Portsmouth, and on Saturday, September 2, there will be excursions to the Isle of Wight, the New Forest, Chichester, Petworth, and Arundel. On the Sunday there will be a special service at St. Mary's Church, at which the Bishop of Winchester will preach.

Zoological Society of Scotland.—We have received the Second Annual Report of this Society, and are glad to see that it is making good progress, the membership having more than doubled during the year discussed (May 1910-May 1911). The pamphlet, which is beautifully illustrated, contains, in addition to the Council's Report, the Financial Statement for the year, etc., an account of a lecture delivered before the Society by Mr. J. H. Paterson, entitled "Examples of Acclimatisation of Animals in Scotland." The lecture shows that many different kinds of animals can be kept in health in Scotland, and that the climate offers no great barrier to the establishment of a zoological garden. The Council of the Society are now engaged in considering various suggested sites near Edinburgh where such a garden could be established.

Commercial Geography.

Hayti and San Domingo.—An interesting account of these two republics appears in the Diplomatic and Consular Reports (No. 4638). In regard to Hayti, it is noted that the buying power of the people is very limited, and British trade is diminishing owing to the increasing competition of goods from the United States. This is especially true with regard to textiles, the principal British import, which are now being largely supplied by the United States. The proximity of the source of supply, rather than the superiority of the articles furnished, appears to be the ruling factor here.

The chief productions of Hayti are sugar, rum, coffee, cocoa, logwood, lignum vitæ, cotton, and cotton seed. The sugar and rum are consumed locally, the coffee and cocoa go to France and Germany, the lignum vitæ and logwood to the United States, and the cotton to Liverpool and Hamburg. The population is wholly agricultural, manufactures being practically non-existent, but agriculture is carried on by the most primitive of methods. Thus the coffee for export is obtained by gathering the berries of the wild trees, and small plots of ground are cultivated by the peasants for their own needs, by means of a kind of bill-hook. Though in the time of the French sugar was exported to the amount of 170,000,000 lbs., now the quantity grown is insufficient to meet the local demand.

In San Domingo there are practically no roads, and almost all communication has to be carried on by water. This is a great obstacle to the development of the region, but a road ten miles in length has been constructed recently, and is to be prolonged for a further twenty miles. The sugar industry is at present undergoing development owing to the action of American corporations, but labour has to be brought from the British Antilles, the natives having been found unsatisfactory. The large amount of American capital invested in the region, and the presence of many large American firms, naturally stimulates trade with the United States rather than with Great Britain. The area of the republic is estimated at 18,045 square miles, and the total population is apparently only some 500,000. The natural resources are great, but are quite undeveloped. As in Hayti, there are practically no ploughs, cultivation being carried on by means of the hoe. As already stated, the sugar industry is being developed, but this demands a large capital outlay, and is not a native industry. On the other hand, cocoa can be grown on a small scale without great outlay, and is a favourite crop with the native agriculturist. Coffee, tobacco, and tropical fruits, on the other hand, are much neglected. Cotton, hemp, and rice have been the subject of promising experiments, but are not greatly cultivated. Much of the rice used, indeed, is imported. A remarkable fact, which illustrates well the conditions in the republic, is that though cattle are raised to a considerable extent, and grazing has always been important, yet the whole of the butter and cheese used in the country is imported.

NEW BOOKS.

EUROPE.

Baedeker's Eastern Alps. Twelfth edition, revised and augmented, with 73 Maps, 16 Plans, and 11 Panoramas. Leipzig: Karl Baedeker. London: T. Fisher Unwin. 1911. *Price* 10*s. net.*

This new edition is greatly amplified and improved. Eighteen new maps and plans, besides three new panoramas, have been added. It is indeed difficult to imagine a more perfect guide than this excellent handbook.

In our review of Baedeker's *Rhine* on p. 384 of the last issue, it should have been stated that Mr. T. Fisher Unwin is the publisher of this as of all the English editions of the guides.

Cook's Tourists' Handbook for Normandy and Brittany. New edition, 1910, thoroughly revised and remodelled. With maps and plans. London: Thos. Cook and Son. *Price* 3*s.*

A simple and very practical guidebook which will be of special value to travellers who avail themselves of Messrs. Cook's tours.

Grieben's Guide Books. Berlin: Albert Goldschmidt. London: Williams and Norgate, 1911.

Vol. 130. *Munich and Environs*, 2 Maps. *Price* 1*s.* 6*d.*
Vol. 131. *The Riviera*, 8 Maps. *Price* 3*s.*
Vol. 141. *Belgium*, 8 Maps. *Price* 3*s.*
Vol. 154. *The Dolomites*, 3 Maps. *Price* 3*s.*

The great advantage of these little guides is their extremely convenient size. If one is paying a visit to Munich it is an undoubted boon to have a handy pocket volume specially devoted to the city itself, instead of having to carry a bulky handbook for Southern Germany. Belgium is usually part of a volume also including Holland, but for the purposes of travel it is certainly better to have them in two separate volumes. Although not nearly so complete as Baedeker, the Grieben Guides will probably satisfy most of the wants of the passing tourist. The volumes devoted to special towns are of course more comprehensive.

ASIA.

An Eastern Miscellany. By the Earl of Ronaldshay, M.P. Edinburgh and London: William Blackwood and Sons, 1911. *Price* 10*s.* 6*d. net.*

The Earl of Ronaldshay, as a geographer and a statesman, needs no introduction to the members of the Royal Scottish Geographical Society. As a traveller in the highways and byways of the East he is a rival of Lord Curzon, and his speeches in parliament and addresses to public bodies have already secured for him a solid reputation as one of the most promising of the younger generation of our statesmen. In the volume now before us he has reproduced a selection of articles, speeches, and addresses (one of them, the address on the Nushki Sistan trade route, delivered to this Society in February 1902—*Scottish Geographical Magazine*, vol. xviii. p. 196), the connecting link between which is that they all refer to the East. By the use of footnotes he has been able to correct figures and statistics, accurate when the speech or address was delivered, but needing revision now. Master of a singularly lucid and graphic style, he is able to secure and

maintain the attention of his readers, whether he is describing a perilous journey over a mountainous pass among the Himalayas or an abstruse problem of tariff reform as applied to India. His knowledge has been acquired by careful study on the spot, and he impresses his readers by his comprehensiveness and impartiality. Our readers will find him a well-informed, judicious, and trusty guide in the study of many obscure and perplexing problems, economic, social, and political, which are of urgent and absorbing interest to the peoples and statesmen of the West, in connection with Persia, India, and Japan.

Les Derniers Barbares. Par Le Commandant D'OLLONE. Paris: Pierre Lafitte et Cie, 1911. *Prix* 15 *francs.*

M. le Vicomte d'Ollone has already had two geographical works "crowned" by l'Académie française, one describing innovating and warlike China in 1907, and the other his expedition in 1898-1900 to the Ivory and Guinea coasts and to the Sudan. In the present volume he describes his expedition in 1906-1907 to China, Tibet, and Mongolia. The book is sumptuously printed and illustrated, and contains several explanatory maps. Authorised alike by the French Government and the Société de Géographie, Commandant d'Ollone's expedition, consisting of himself, three brother officers, with Annamite and Chinese servants, left Hanoi (Indo-China) in December 1906 for the Chinese province of Sechuan. Their explorations really began at Yunnan-sen, the capital of Yunnan, after which they crossed the Yang-tse-Kiang in three boats and reached the town of Tong-Ngan-Cheu, which they found governed by the mother of a Lolo prince during his minority. At Ning-Yuan-Fu they were greeted by French priests and their Christian converts, and with their aid were enabled to enter the independent Lolo territory so jealously guarded from the Chinese and white travellers, especially if the latter wish to discover mines. The Lolos are of an Indo-European type, and their nobles go about accompanied by serfs carrying immense spears, bows and arrows, and sometimes guns. Their country is mountainous, the chief mountain the Long-Teu-chan (dragon's head) being 15,000 feet high, and, while occupied by clans, the land belongs entirely to the nobles. Our travellers were well received, and considered the Lolos a fine race, their men being often six feet in height, and their women holding a position much superior to those in China.

Leaving the interesting country of the Lolos, which he describes so well, the Commandant's expedition pushed on to Tibet, their Tibetan and Chinese servants casting stones on a cairn on the col of Lang-Kia-Ling in honour of the genius of the place, for Buddhists are really pantheists and see spirits everywhere. Escorted by Tibetan soldiers armed with long lances, the expedition reached the village of Pan-yu, the dwellings in which are underground, and both men and women have only sheep-skins for covering their shoulders. They found that the Indian Government did a great trade here by furnishing the women with old Indian army buttons, and our travellers were amused seeing the numbers of the Indian regiments displayed on the women's breasts. Neither communism nor polyandry exist, as some have alleged. The expedition proceeded further into Tibet and discovered the Hoang-ho "in the only part of its capricious course which had remained unknown, a discovery which will enable geographers, with the aid of information obtained by German explorers, to establish definitely the basis of the hydrographic and orographic system of the region." The expedition had attained its object and advanced to Lhabrang, a picturesque town, which is the largest in Tibet after Lhasa and Tachilumpo. Five thousand monks live there in identically similar white cells, connected with twenty convents, each having its superior, its

church, its library, and its rooms for study and assembly, the whole buildings being the most magnificent the expedition had ever seen in this immense empire. After meeting the Pelliot expedition at Lan-Chou, the Commandant's passed along the Gobi desert close to the Great Wall, now in ruins, and then, leaving his exhausted companions to get to Peking by a direct route, the indefatigable Commandant pushed on by himself to the Belgian Roman Catholic missionary station of San-Tao-Ho, where, buried in Mongolia, a little Christian republic has been formed, and thirty villages grouped in eleven parishes form a bishopric, and where forestry and irrigation have worked wonders. At Yun-Kang he was suddenly confronted by a colossal statue of Buddha, eighteen feet high, with splendidly carved subterranean temples. At Wu-Tai-Chan, the Commandant offered a Khata or Scarf of Happiness to the Dalai Lama, who gave him two in return, one for himself and another for "his Emperor." And thus he reached Peking after having travelled 4000 miles, of which 1600 were over absolutely new ground, and having amassed details which occupy seven volumes now in course of publication—an achievement worthy of a great French explorer.

La Grande Artère de la Chine: le Yangtsé. Par JOSEPH DAUTREMER, Consul de France, etc. Paris: E. Guilmoto. *Prix* 6 *frs.*

This book, as the title indicates, treats of the provinces of central China which are included in the basin of the river Yangtse. M. Dautremer (who is also author of *L'Empire japonais et sa vie économique*) occupied the position of Consul for France in the important trading centre of Hankow. He appears to have travelled much in the western provinces of China, and, although the personal note is conspicuously absent in the volume before us, he displays an intimate knowledge of his subject. Much of the book is taken up with statistics of trade, apparently taken from Customs returns and Chamber of Commerce reports. He writes mainly with the object of promoting French trade with China; but there is a wealth of information which will be found useful to any who are interested in the general broad question of trade with that country, although much of it may be caviare to the general.

M. Dautremer has a good deal to say on the subject of Japanese influence in the central provinces. Speaking of the recent exhibition which was held at Nanking, he writes:—"C'est à Nankin qu'a eu lieu, en 1910, la première manifestation de la nouvelle Chine: de la Chine qui se transforme, qui s'occidentalise, et cela avec une telle rapidité que la poste ou le télégraphe nous apporte constamment l'écho de quelque changement. . . . L'exposition me paraît avoir été lancée sous l'influence japonaise, et il est d'ailleurs hors de doute que le voisin de l'est est partout en Chine à l'heure actuelle. C'est lui qui pousse le colosse chinois toujours en avant, avec l'idée bien arrêtée de le guider où il voudra et de profiter de lui, à l'exclusion de tous les étrangers qui voudraient cependant dire leur mot en l'occurrence."

It is also in this connection that he narrates an incident of the visit of a Japanese ship of war to a port on the Yangtse. The captain, *homme fort aimable*, called on the author and invited him to breakfast on board. A long table was set for about thirty covers in the 'tween decks, and about as many guests attended, amongst whom he observed a score or more of young Chinese. At first he paid little attention, but he soon saw that the Chinese were no other than Japanese in disguise. They had just arrived from various parts of the provinces of Hupe and Hunan, where they had been studying local conditions, and they were on board the man-of-war to make their reports to the captain.

This took place about twelve years ago, and the Japanese now permeate the interior of China without taking so much trouble over disguises; but they are unquestionably the most serious competitors we have to encounter in the effort to maintain our position in China and retain Britain's share of the trade.

In the chapter on the province of Kuie Chow we find an interesting account of the Miao Tsu, or aboriginal tribes of China, who inhabit it and the borders of the neighbouring province of Yunnan, and who live in a state of semi-independence under officials specially appointed from Peking. The author's account of a pilgrimage he made to the sacred mountain of Omei (in Sechuan), and to the monastery of the Ten Thousand Ages, which is situated half-way to the summit, is worth reading. Sechuan is undoubtedly the richest of the provinces of China, as regards its soil and natural products, and it is only the danger and difficulty attending on navigation of the rapids of the Yangtse, for a part of the river above Ichang, which stand in the way of the growth of a trade already of vast importance. If the projected railway from Hankow into Sechuan is built, it will get round the rapids, and so vastly facilitate this growth. M. Dautremer's interest is, naturally, chiefly concentrated upon the French line of railway which runs from Tongking into Yunnan, following the course of the Red River from its mouth at Haiphong. As regards the project to carry this line further north, from its present terminus at the capital of Yunnan, and so to join Sechuan to French Indo-China, M. Dautremer expresses the opinion that such a line can never hope to compete successfully with the great water-way of the Yangtse having its outlet at Shanghai. Yunnan itself is a poor province, mountainous and sparsely peopled, and the opening of the cities of Mêng Tsu and Ssu Mao to foreign trade does not appear to have been of much benefit to French commerce, although Mêng Tsu is on the railway line; but the latter affords a pleasant change for the French colonists, enabling them to escape for a time from the enervating climate of Tongking to the healthier uplands of Yunnan. The cities of Yunnan Fu and Tali Fu are the great centres of the Mohammedan population of China, but they have never recovered from the effects of the desolating war which raged between imperialists and Mussulmans prior to 1875.

In conclusion, we may notice the reference which M. Dautremer makes to the problem of making a railway across the mountain ranges which separate the valleys of the Salwin and Mekong, and, by linking up Momein with Tali Fu, so connect western China with the railway systems of Burma and India. The nut is a hard one to crack, but the author is of opinion that the engineers will manage it some day soon.

M. Dautremer refrains from calling the Yangtse the "Fleuve Bleu," which is something to be grateful for in a French writer!

Since the above was written, the news is telegraphed by the *Times* correspondent at Peking that, by imperial edict, a contract was signed on May 20th authorising the construction of a railway of 200 miles from Ichang to the borders of Sechuan, which will get over the worst of the dreaded rapids.

L'Indo-Chine Française. Par H. Russier et H. Brenier. Paris: Armand Colin, 1911. *Prix* 4 *frs.*

While Mme. Vassal in her *On and Off Duty in Annam* (reviewed on p. 437, of vol. xxvi.) gave a general view of that province, the present writers furnish scientific details of all Indo-China. As Dr. Russier is Inspector of Schools in Cochin-China, and M. Brenier is an Agricultural and Commercial Inspector of Indo-China, their volume may almost be termed an official work. It is certainly

very thorough and well arranged, and is divided into four parts, viz. the country, its inhabitants, its economic value, and its political and administrative organisation. It is fully illustrated and contains four valuable maps indicating, by means of colours, physical, economic and administrative Indo-China, Cochin-China, and Tonkin. We are informed that the chief subject of culture is rice, that being the principal food-supply of the people of Indo-China. At the same time, pepper, tea, coffee, and sugar are also cultivated, while cotton is a promising crop along the banks of the Mekong and in Cambodia. "Industrial experiments made with Cambodian cotton in France have been very satisfactory. It is certain that this cotton will, to a large extent, supersede Indian cotton, of which the mother country uses every year thirty million francs' worth and Indo-China nearly three millions. The extension of cotton-growing in Cambodia is, it is true, bound up with that of irrigation works."

Jute grows well at Tonkin, but is not much cultivated although it is much wanted in Indo-China for ropes and sacking. Indiarubber is very extensively and successfully cultivated on the red lands of Eastern Cochin-China, one million plants being put in in 1910. The Tonkin district is rich in minerals, coal and lignite being extensively worked, while there are also numerous mines of zinc, tin, iron, lead, and gold. The authors severely condemn those Frenchmen who have advocated the abandonment of Indo-China, declaring that such critics must be ignorant of the extent and value of what France has accomplished there. From the Budget figures they give, for 1910, the receipts from Indo-China considerably exceed the expenses.

AFRICA.

Spindrift and Sand-drift. By Marshall N. Gould. London: George Allen and Sons, 1911. *Price* 3*s.* 6*d.*

In this book we have a bright, sprightly, and often amusing account of a trip to South Africa. On arriving there the author and his companions visited some of the well-known towns, e.g. Cape Town, Kimberley, Bloemfontein, Johannesburg, Ladysmith; and under the guise of humorous remarks he makes some shrewd observations on what he saw.

AMERICA.

The Fair Dominion: A Record of Canadian Impressions. By R. E. Vernède. London: Kegan Paul, Trench, Trübner and Co., Ltd., 1911. *Price* 7*s.* 6*d. net.*

This volume contains a pleasantly written series of sketches describing some of the highways and byways of Canada. Some of them are based on contributions to the *Bystander*, a journal which requires from its contributors that their articles be "up to date and not too solemn." Mr. Vernède eschews statistics, and revels in descriptions of scenery and places, and it need hardly be said that in Canada he has ample scope and variety of subjects. He has nothing new to tell us, but he goes over old ground with freshness and lightness of touch, and invests well-known places and scenes with new interest and charm.

The Golden Land. By Arthur E. Copping. London: Hodder and Stoughton, 1911. *Price* 6*s.*

This work is written from the Canadian emigrant's point of view, and from the personal investigations and observations of the writer sets forth in rosy

colours the successes of various classes of emigrants. It does not conceal that throughout the greater part of his career, and more especially at the beginning of it, the emigrant will have to work hard, and must expect occasional misfortunes as well as successes. But the whole tone of the book is optimistic, and as it is the work, as we have already said, of one who has seen and tested what he describes, it may be trusted as conveying a fairly true picture of the prospects of emigrants who are ready to put their hand to any work that is offered to them. Some experience and capital are of course a great advantage, but they are not essential; the demand for labour in immense tracts of Canada is so great that any one who is willing and physically able is sure to find an opportunity of maintaining himself or herself in comparative comfort till he or she has been able to save enough capital wherewith to begin an independent life. Some useful information is also given regarding emigration agencies.

POLAR.

Polar Exploration. By William S. Bruce, LL.D., F.R.S.E. With two Charts. London: Williams and Norgate, 1911. *Price* 1*s. net.*

This little volume, which forms one of the publishers' series entitled the Home University Library, is in no way intended to be a history of Polar exploration. It is, as its author states, merely a "traveller's sample," revealing to some extent what is in the great Polar "warehouses." It is based, firstly, on the author's personal experiences during nine Polar voyages; secondly, on his acquaintance with many recent explorers and their work. Naturally the personal note predominates, and those parts visited by the author are dealt with in greater detail than others, but the attempt is made to deal with facts and problems of general rather than local interest. It would be impossible, within the limits prescribed, to give anything like a full account of Polar Exploration, and what little may be lost by the author's method of treating the subject is far more than made up for by the vividness of description and the feeling of the fascination of a scientist's life in the Polar regions which Dr. Bruce contrives to give, and which could only be given by an enthusiast like him with wide personal experience of his subject. The work can be heartily recommended to any one wishing for a general account of Polar lands and seas, of ice, of plant and animal life both in the Arctic and the Antarctic; of the problems still awaiting solution in the regions around the uttermost parts of the earth, and of the methods by which the explorer attacks these problems; he will find here no sit-at-home geographer's compilation, but a vivid description which will be as a call from the wild to any one who has ever been amongst ice or who has the roving spirit in his blood.

The Voyage of the "Why Not?" in the Antarctic. The Journal of the Second French Polar Expedition, 1908-1910. By Dr. Jean Charcot. English version by Philip Walsh. London: Hodder and Stoughton, 1911. *Price* 20*s. net.*

We reviewed here, on page 106, the French edition of Dr. Charcot's book, and are now glad to welcome the English version, which will make the book available to a larger public. The English edition is well-printed and got-up, and though the volume is stouter, yet it is lighter to hold and easier to handle than the French one. The illustrations are reduced in number as compared with the original, but are all printed on special paper, and thus come out well. An index has been added, but the scientific appendices of the original have been omitted.

The translation reads tolerably well on the whole, but technical or scientific terms are often inadequately rendered, so that the meaning may become obscure. Thus we find "measurement of rays," a very vague phrase, given as a translation of actinométrie; "frost-nails" for crampons, a term familiar to all mountaineers; "crabbing seal" for crab-eating seal, and so forth. Readers of other works on polar exploration will, we think, have some difficulty in recognising the familiar sleeping-bag under the form "bed-sack" in which it appears here. Further, sufficient care has not always been taken in the rendering of the French tenses, with the result that many subtleties in the original are lost, thus detracting from the enjoyment of a singularly fresh and interesting book.

GENERAL.

Die Kultur der Araber. Von Dr. Joseph Hell, a.o. Professor an der Universtität München. Leipzig: Quelle und Meyer, 1909. *Preis, geb.* 1.25 *M.*

This is an excellent little book giving in small compass a very lucid view of the condition of Arabia previous to the advent of Mohammed and the marvellous results due to the rise of Islam. Very justly a good deal of space is devoted to expounding the difficulties which Mohammed encountered in spreading his new faith and to the precise manner in which his early successes were achieved. The author also throws a remarkably clear light upon the policy by which the Mohammedans achieved their extraordinary conquests in the century following the death of Mohammed, and then, in accordance with the title of the work, shows how those conquests reacted upon the conquerors in awakening the wants which led to the cultivation of art, science, literature, and philosophy, from Mesopotamia to North Africa and Spain. The only point on which one would like to have obtained from the author a little fuller information is as to the nature of that teaching which inspired so much devotion in at least some of the followers of the prophet. There is hardly anything in the little book that can throw light, for example, upon the deep and earnest piety of such a man as Al Ghazzāli.

Handbuch der Oceanographie. Von Dr. Otto Krümmel, ordentlichem Professor der Geographie an der Universität in Kiel. Band ii. Stuttgart: J. Engelhorn's Nachfolger, 1911. *Preis* 32 *M.*

The second volume of this work (cf. vol. xxiv., p. 111), treats of the movements of sea water—waves, tides, and currents. The trochoidal theory of wave motion in deep water is fully set forth, and the formulæ of Airy, Stokes, Chrystal, and others, for waves in shallow water, seiches or stationary waves and other forms are carefully explained. Equally thorough is the discussion of tides and the theories which have been propounded to account for their variations and peculiarities, while the rotation of the earth, the land contours, interference, etc., are shown to account for certain extraordinary phenomena in various parts of the world. Currents are produced or modified by difference of density due to variations in the salinity, which again is dependent on radiation, precipitation, etc., and by wind, atmospheric pressure, friction, the configuration of the sea basins, etc.

The theory having been first fully developed the results are compared with actual observations, and the apparatus by which the movements of sea water are recorded, and various means of taking eye-observations are explained with diagrams and illustrations.

This short enumeration of the contents gives only a faint notion of the vast mass of information contained in this work. The student of oceanography who

has sufficient mathematical knowledge will find here information on all points, and if he requires still fuller detail, the numerous references to other works will help him in his search. And those who are only interested in the subject generally as a branch of geography will read with appreciation the descriptions of tides and currents produced by special conditions, as in the Adriatic, the Gulf of St. Lawrence, the Red Sea, etc. Dr. Krümmel's work ought to find a place in every geographical library.

Modern Geography. By Marion I. Newbigin, D.Sc. London: Williams and Norgate, 1910. *Price* 1*s.*

The author dates the commencement of the new era of geography from the year 1859, when those great geographers, Friedrich Baron von Humboldt and Karl Ritter died, and Darwin's *Origin of Species* was published. She considers that Darwin's "doctrine of evolution has had, and is having, an enormous effect upon geographical science, both directly and indirectly." The standpoint of *Modern Geography* "is frankly anthropological, that is, the world is considered as the home of Man, its physical peculiarities being regarded as interesting chiefly in their relation to Man and his activities." In illustrating her subject the author discusses Erosion, Ice-action, Climate, and Plant and Animal Life, and proves that all the movements of Man "were only part of a great series which included also those of plants and animals."

In her chapter on "The Races of Europe and their Origin" the author strikes a note of unusual interest. She clears away "certain misconceptions and difficulties" by showing, first, that Nationality has nothing to do with Race in an anthropological sense. "There is no British race, no French race, no German race, even though the word Germanic is sometimes applied to one of the strains which occurs in the German Empire." Again, "Language has nothing to do with Race." Even the comparatively small Iberian peninsula contains a population speaking four separate tongues, the Portuguese, Castilian, Catalan and Basque languages. "Mediterranean man" was an immigrant from the North of Africa, and his long "barrows" or burial-places are found as far north as the Clyde valley, side by side with the later round barrows containing the cremated remains of the second great European race called Alpine, Celtic, Eurasiatic or Celto-Slavic by different anthropologists. "This conflict of races which has left its traces in the Clyde valley apparently occurred in other parts of Europe." But while it is true that the nations of Europe are not Races in the pure sense, we may note that "in the Western nations, one or other of the two chief races tends to predominate at the expense of the other. Thus, broadly, we may say that the antagonism between the French and German nationalities is fed by the fact that in race, in culture, in tradition, the one is predominantly Mediterranean, and the other predominantly Teutonic."

The New Outlook Geography. By W. C. Brown, M.A., F.C.P., and P. H. Johnson, B.A., L.C.P. Book I. *How People Live.* Pt. 1. The British Isles; Pt. 2. Outside the British Isles. Scottish Edition revised and adapted to the use of Scottish Schools by H. J. Findlay, M.A. *Price* 1*s.* 6*d.* complete, or the two parts separate at 9*d.* each. 1910. Book II. *The Home of Man.* Pt. 1. The British Isles. *Price* 2*s.* 6*d.* 1911. London: Geo. G. Harrap and Co.

The authors state that this new series of geographies is an attempt to strike a happy medium between the old geography books and the new ones, which they

describe as reactionary, and giving very little information about geography. They also state that they have sought by the constant introduction of questions into the text to emphasise the fact that the teaching must be living and not a mere lecture or reading lesson. We rather doubt whether this end can be attained by the means adopted, and the intercalation of the questions has the great objection that it prevents the studious child from reading the books on his own account, by destroying all continuity in the text. In Book I. also, some of the questions seem very trivial, and not beyond the range of the invention even of the most inexperienced teacher.

In Book I. various imaginary journeys are given, but the authors seem scarcely to realise how much detailed knowledge is necessary before these can be successfully described. It is implied that on a journey from Marseilles to Paris the traveller might pass through St. Etienne, Normandy, Brittany, the beet-root country, and the town of Lille—a somewhat erratic route! The youthful traveller also is told that vineyards occur in the *south* and *central* regions of France. Under which heading do the famous districts of Champagne and Burgundy fall? He is also told that as he travels southward from England through France the air gets warmer. To which we should reply that a journey from Edinburgh to *e.g.* the city of Lyons in January would probably cause him to change his opinion.

Book II., which is of a more advanced nature, has the advantage of including a large amount of physical geography with the descriptive part.

Beginnings: or Glimpses of Vanished Civilisations. By MARION M'MURROUGH MULHALL. London: Longmans, Green and Co., 1911. *Price* 2*s.* 6*d. net.*

The author states in the preface that the object of this book is "to simplify the story of the early beginnings of our world, and to trace the origin of the vanished civilisations, remains of which are now being brought to light every day by distinguished archæologists," and the book is dedicated to "all my young friends, boys and girls." There is no table of contents, no index, and one only of the seven chapters has a heading. The text is largely made up of quotations, the authors quoted ranging from the late Duke of Argyll through Sir Oliver Lodge to anonymous magazine writers. We find ourselves unable to form any clear idea of the scope of the book, or the conclusions at which its author wishes to arrive, but quote two passages as indicating its style:—"What a pity learned men were not more cautious in former times. How much infidelity might have been prevented." . . . "Nothing once cast into the wide abyss of time is ever lost."

The Mediterranean. Seaports and Sea Routes, including Madeira, the Canary Islands, the coast of Morocco, Algeria, and Tunisia. Handbook for Travellers. By KARL BAEDEKER. With 38 maps and 49 plans. Leipzig: Karl Baedeker. London: T. Fisher Unwin. *Price* 12*s. net.* 1911.

In vol. xxvi., p. 157, we reviewed here the German issue of this useful guide. The present is the first English Edition, and will be cordially welcomed by English-speaking visitors to the inland sea. It has a preface by Emeritus Professor Kirkpatrick, formerly of Edinburgh University, and shows various minor modifications as compared with the German issue. We note among the improvements that the sea-routes are now shown on the map which forms the frontispiece. All the various regions discussed in the volume are favourite resorts for the inhabitants of these islands during the colder parts of our year, and the new Baedeker is assured of a cordial welcome and a large circulation.

BOOKS RECEIVED.

The Opening up of Africa (*Home University Library*). By Sir H. H. Johnston, G.C.M.G., K.C.B., D.Sc., F.Z.S. Cr. 8vo. Pp. 255. *Price* 1*s. net.* London: Williams and Norgate, 1911.

Mediæval Europe (*Home University Library*). By H. W. C. Davis, M.A. Cr. 8vo. Pp. 256. *Price* 1*s. net.* London: Williams and Norgate, 1911.

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THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

THE PLANT-GEOGRAPHY OF ARDGOIL.[1]

By Thomas Nisbet, M.A.

(*With Maps and Figures.*)

In 1905 and in 1906, Mr. Cameron Corbett, M.P., purchased and presented to the City of Glasgow an area of 14,600 acres bordering on Loch Goil and Loch Long, and extending from the peninsula between these lochs in a northerly direction to Ben Ime. As this district had no definite name, many suggestions were offered, and finally the artificial compound "Ardgoil" was adopted by the Corporation as the name of the new highland estate. Nominally a public park, it is wholly in a natural state, and affords a free field for amateurs to investigate minor problems dependent on surface conditions.

A recent attempt to survey the flora of this region has suggested that it may be of interest to give a short account of the way in which the vegetation has been broken up into types by the influence of various geographical factors. For this purpose the rare or uncommon may be ignored, and attention paid only to those plants which produce, in various combinations, outstanding features. Each plant or association of plants is a "bio-sum." This bio-sum is a function of variables whose determination lies largely within the sphere of geography, but it is difficult to know all the variables, and especially to select the controlling factor, which has often a direct bearing on the operations of man and beast.

The district more particularly referred to consists of the peninsula which separates Loch Long from Loch Goil. The range of high and rugged schistose hills which bounds the western shore of Loch Long is

[1] A paper read to the Geographical Section of the Royal Philosophical Society of Glasgow on 13th January 1911.

MAP OF ARDGOIL DISTRICT.

Scale—One inch to a mile.

Reproduced from the Ordinance Survey with the sanction of the Controller at H.M. Stationery Office.

broken through by the great valley of Glencroe. The southern portion is further divided by Coilessan Glen and Guanan Glen. Of these the latter is a hanging valley, whereas the former seems to have been subject to the post-glacial eroding agents that reduced Glencroe to a deep V-shaped valley. Consequently Coilessan Glen on a small scale, and Glencroe on a large, have deltas at their mouths and low-level spurs in their lower parts.

Between these glens three massive blocks stand out prominently, namely, the Brack, the Cnoc and Ben Reithe. The summits of these hills lie on a line which dips southwards from Ben Ime, the central summit of the Arrochar Alps, and passes in succession Ben Ime (3318 feet), Ben Narnain (3000 feet), Ben Arthur (2891 feet), the Brack (2580 feet), the Cnoc (2497 feet) and Ben Reithe (2141 feet).

South of Ben Reithe, and separated from it by a bealach or pass, is the Saddle (1704 feet), the saddle-shaped top being most striking from the west side of Loch Goil. The line of this pass has been laid on an east to west fault which crosses the peninsula. South from the Saddle the range falls rapidly to the junction of the two lochs, but to the west of its southern end a short ridge rises to 1400 feet and presents the singularly rugged aspect which makes the entrance to Loch Goil so striking.

Beginning in a col about 1000 feet above the bottom of Glencroe and 1500 feet above sea-level, Corrie Odhair, the dun corrie, stretches in a south-westerly direction, separating Ben Donich on the west from the Brack and the Cnoc on the east. This corrie finds a narrow outlet near the head of Loch Goil between Ben Donich and the Steeple. The latter is a very steep and rocky hill, 1250 feet high, immediately east of Lochgoilhead. Ridges connect it with the craggy Carn Glas, which to the south-east is joined to Ben Reithe.

These lines of hills form the watersheds of several considerable streams, which generally present the similar features of a tripartite course—a steep upper course generally at right angles with the main stream, a middle course moderately steep or gently sloping, and a very steep lower course, sometimes precipitous and wooded down to the sea. The chief streams are the River Goil with the Onich, Coilessan burn and Guanan burn. At the eastern base of Clach Bheinn is Corran Lochan, whose area is only about nine acres.

Over this district the plant life is distributed in a way which may be understood most easily by taking successive zones of altitude, beginning at the lowest. At the head of Loch Goil, the River Goil, aided by some small streams, has produced extensive deposits of fine sand and mud. The river reaches a level only 50 feet above the sea at a distance of $2\frac{1}{2}$ miles from its mouth, and for about $1\frac{3}{4}$ miles flows along almost on a dead level. Hence the coarser products of denudation are deposited before the mouth is reached, and the deposits at the mouth consist of very fine sand and mud. On the eastern half of the delta the proportion of mud is greatest, and the surface is very gently sloping, as a fine mud deposit in water must be, if stable. On such a base seaweeds cannot develop, because they can find nothing in which to anchor themselves, for

seaweeds derive their substance from the materials dissolved in sea-water, and do not fix themselves by penetrating the mud with an absorbing root system. For this purpose a plant with a network of roots is needed, so that, once it has established itself, it may thrive in spite of small displacements of the muddy floor. Such a plant is *Zostera marina*, the sea-grass wrack. Its long ribbon-like leaves prevent its being torn by the undulations which fluid motion sets up on a flat surface. The food

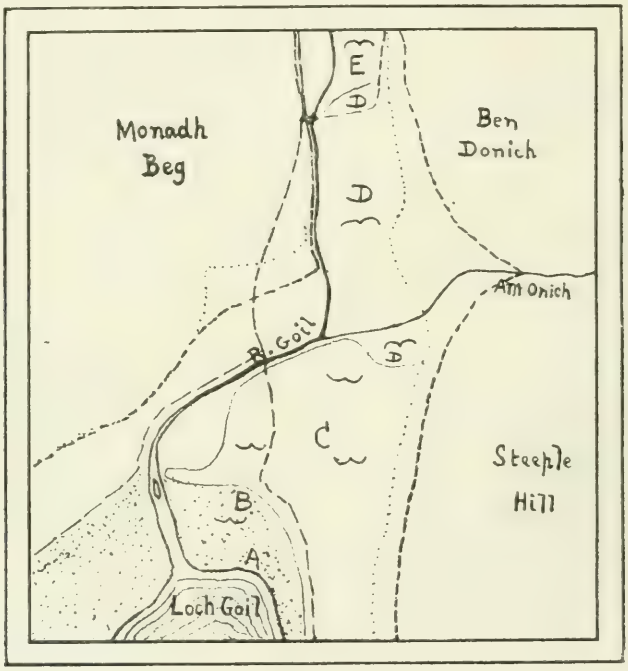

Fig. 1.—Sketch-map of Lower Glen Goil.

— — — Roads; ------ Boundary of alluvium; ..... 50-feet contour line.

A. Bed of Zostera; B, Salt-grass; C, Terrace with Agrostis and Holcus dominant; D, Continuation of C, lowered by erosion, till recently arable, now the site of Y.M.C.A. camp; E, End of flat of Upper Glen Goil, with rush dominant.

of this plant comes through its roots from the substratum, but in its reproduction it imitates the seaweeds, the fertilising pollen threads being carried by the sea-water from one plant to another. The grass wrack at Lochgoilhead—*Zostera marina*, var. *angustifolia*, Syme—makes a green meadow extending considerably below low-tide mark and for a short distance above. Similar beds are found at the head of the Gareloch, but the greatest development in the Clyde is at Fairlie, where Zostera covers hundreds of acres over the great flats south of the pier.

Near high-tide level the muddy flats afford roothold for plants which are not injured by occasional submergence, and which thrive when salt is

present in the water absorbed by the roots. For a short distance above and below high-water mark these plants form a green sward which is usually characterised by gaps where storms have broken into the turf. This is the zone of the salt-grass. The species mainly active is *Glyceria maritima*, the sea meadow-grass. It has creeping stolons and a very profuse development of fine hair-like roots, the intermatting of which makes a turf which is exceedingly tenacious against wave action, so that even when the sea has gained the victory and almost annihilated it, remnants may still be seen along the shore, standing up in defiance of the elements like Ailsa Craig or the Bass Rock. The sea-plantain, *Plantago maritima*, and the Michaelmas Daisy, *Aster tripolium*, are common

FIG. 2. —Salt-grass formation at Lochgoilhead, with typical eroded margin.

associates, and also the sea-pink, *Almeria vulgaris*, which, however, is often absent.

This type of sward in various degrees of development is a frequent feature on the shores of the Firth, but not to the same extent as in other places such as near the mouth of the Eden, north from the golf links of St. Andrews. The salt-grass of the latter area is either increasing or at least re-establishing itself where encroached upon, whereas the sward described is suffering gradual diminution by erosion and turf-cutting for local use. Further, the sward at Lochgoilhead passes without break upwards into the flora of the shore margin, whereas at the mouth of the Eden there is a broad band of separation, for the sweep of the spring tides is so much greater than at the head of the lochs, that the marginal banks of shifting sand effectually separate the two zones.

The next zone is above the reach of ordinary tides, but enjoys an

occasional wetting with spray. It is formed by the rock-belt which fringes the greater part of the coast of Ardgoil, so that it is the typical shore margin. The rocks are schists varying in the degree to which seams have opened up between the folia. Wherever these are deep enough for soil to gather, either or both of two plants already named may be found, the sea-pink and the sea-plantain, the former being the commoner. Although they occur in the sward of the salt-grass they are better fitted for penetrating the clefts of rocks, for they possess a long tap-root which can bring supplies of necessary moisture from the recesses of the clefts, and the xerophytic structure of the leaves enables them to resist the desiccation which ensues when the summer sun heats the rocks which they inhabit. For example, the Carraig nan Ron, the Dog Rock, is a low rock at the south-east corner of the peninsula between Loch Goil and Loch Long. It consists of schist with the folia dipping south-east at a high angle, and in the crevices, which necessarily strike north-east and south-west, the sea-pink flourishes. It is abundant from high-tide level up to near the top of the rock, which is only about five feet above high-water. In hollows on the top, where rain-water has a chance of keeping the soil moist, is a considerable growth of *Poa annua*, the annual meadow-grass.

Of local occurrence in patches and strips between the rocks are a few shingle-beaches, and on these only one shingle plant is developed, the silver-weed, *Potentilla anserina*. The silky, silvery hairs of this plant are strongly developed on shingles, and prevent air movements reaching the plant tissues when dry weather and strong sunshine render the shingles a desert to other forms of plant-life. Silver-weed from the shingles has colonised the roadsides, but it is absent from the hills.

With the one exception named, the zones so far mentioned are but shreds and patches of zones, because the physical conditions necessary for their development occur in shreds and patches. This, again, is a result of the steep slope of the rocky hillside into the loch, so that the rock zone is the only extended one.

Leaving the shore, the next level that claims attention is the bottom of Glen Goil. The River Goil drains a basin of about 15 square miles, of which its principal tributary the Onich drains about 4 square miles. The flat of the Glen occupies only about 275 acres, or less than one-thirtieth of the whole basin. It is about 2½ miles long, and is narrow. The 50-feet contour follows closely the margin of the flat, and there the hillsides rise abruptly. The lower part, about 100 acres in extent, slopes up gradually from the beach at the head of Loch Goil to a level of about 30 feet, and in some parts continues almost level, or in other parts rises very gradually up to about 50 feet. The terrace stops abruptly on the north side as a high bank of the River Goil, which sweeps westwards and southwards round its base to the sea. The upper part of Glen Goil is little elevated above the stream, and is frequently overflowed by spates, the flood-water touching the base of the hills on either side. From these features it would seem that during the period of the 50-feet beach, the River Onich from the east side threw out a large delta, the materials for which were derived from the extensive moraines of Corrie

Odhair. A portion of this delta extended northwards, but the main part stretched west and south. Meanwhile the Goil was gradually filling up the hollow above, which may have been for some time a lake dammed back by the delta of the Onich. The northern and western extremities of this delta have suffered considerable erosion by the subsequent action of the Onich and the Goil. These rivers, after beginning to break into the delta on the east side, have been finally deflected west by the impulse of the Onich torrent, and the combined river has always found an exit by the west side of the valley. Consequently, the lower 100 acres of Glen Goil form a marked terrace lying far above the level of the river, naturally drained and easily cultivated. The greater part, however, is out of regular cultivation, and is either pastured by horses and cattle or cut for hay. Hence this terrace is not an area which is solely under the influence of physical conditions, but is still being modified by man and domestic animals.

These modifications tend to the establishing of a distribution of plants over the area different from the original flora. The physical conditions tend to the re-establishing of the original flora. What one can determine by observation in such an area is the result when a cultivated piece of ground is left untilled for a number of years, in short, what is the reversion-flora. A hay-field on one of the lower terraces, near the River Onich, two years before produced a root crop, and therefore had been cleaned of weeds as well as possible. It showed in 1909 as the most important constituent, rye-grass, *Lolium perenne*, which is what is wanted, but two other grasses are in fair quantity, purple-bent and Yorkshire fog, *Agrostis vulgaris* and *Holcus lanatus*, and other eight species of plants occur here and there. In an older part of the same field, where at least another year has allowed the reversion-flora to win its victory, rye-grass has been almost overwhelmed and become of little significance in the ultimate crop, but Agrostis and Holcus have become dominant, and a third grass absent in the first case has suddenly sprung into prominence. This is the sweet vernal grass—*Anthoxanthum odoratum*—which gives the scent to hay. Besides these, other fifteen species have become common constituents of the flora.

A very old field on the higher terrace, which has for long been used for meadow hay only, shows further developments. Rye-grass is now quite absent. The two grasses, Agrostis and Holcus, already named, are dominant, and Anthoxanthum is still an important constituent, but these grasses no longer form such a large proportion of the total crop. Other thirty-two species, some of them very plentiful, are found, and a tendency is manifest towards differentiation into areas with somewhat different floras. But these minor differences do not affect the general dominance of the two grasses, Agrostis and Holcus, over the whole field. I have not enough material at present to discuss satisfactorily still older fields, but the inference seems sufficiently warranted that the reversion-flora of this area is one with the grasses *Agrostis vulgaris* and *Holcus lanatus* dominant. These are the dominant poor-pasture grasses all over Britain, except in the extreme south.

Both these grasses are surface-feeders, they are not fond of wet

soil, they are content with meagre food supplies, and what is of more importance, they are protected against desiccation, the former by the structure of the leaf, the latter by its coating of woolly hairs, as the specific name implies. It is evident that over an area consisting mainly of alluvial gravels the surface layers will in summer become dry somewhat suddenly, there being no water at moderate depths to rise by capillarity. Rye-grass is not protected against such desiccation, so that a week or two of exceptional hot dry weather in summer may be sufficient to determine the dominance of Agrostis and Holcus and the comparative annihilation of Lolium, even in a region of great annual rainfall.

The nutrient value of these grasses is low compared with rye-grass, and the hay derived from the thirty-six or more species in the last-named field must be much inferior, but it is probable that the expense of keeping the ground clean and so securing the crop of rye-grass on such an area is too great in relation to the higher nutrient value secured. This, however, is a question for economic agriculture.

The flats further up Glen Goil present a different aspect. The 50-feet contour is at the level of the road on the bridge where it crosses the Goil above Inveronich, and the same contour crosses from bank to bank of the river about $1\frac{3}{4}$ miles higher up the stream. Between these two points the river winds about a good deal through the flats, and at two places makes oxbows, which have been cut off by artificial straightening of the channel. The river at places of overflow was formerly embanked, the levées now being out of repair. The river bed consists of fine gravel or sand: no large stones are seen, rock nowhere appears in the glen bottom or in the stream bed, and there are some deep pools. The fields on each side are only two or three feet above ordinary river level, and are subject to much soaking by the run-off from the steep hills on each side. There is no adequate system of deep intercepting drains, hence the water table is permanently near the surface.

Under such conditions the rushes gain ascendency. Of these the dominant in the valley flat is the Jointed Rush—*Juncus articulatus*, var. *acutiflorus*, Ehrh. The rhizome of this plant grows horizontally through the sub-surface mire, or at such a depth that the roots easily reach wet sub-soil. The presence of the rushes indicates defective drainage, and the form common over this area indicates a wetter condition than would the common rush—*Juncus communis*. In some fields the surface of the ground is comparatively firm, but the strong development of rushes shows how near to the surface the water table is. The overflow in spates leaves a deposit of alluvium over considerable stretches of the valley flat, and the only condition needed to subdue the rush and make the valley fertile is efficient drainage. The obstacle to such drainage is located at the point where the road crosses the river, a point naturally placed where the northern margin of the ancient Onich delta throws the river Goil for the first time in its valley course against the base of the hill on the western side. Below this constriction the river falls rapidly, but above it the flood water is thrown back on the almost level glen bottom. The drains are liable to be choked, as the possible gradient in them is so slight, and hence efficient drainage is difficult and in some parts

impossible. Previous attempts at drainage have been successful only for a few years, and the reversion-flora, with the jointed rush dominant, has asserted itself before the outlay was recovered. The Corporation of Glasgow is again making an expensive experiment, which meanwhile gives an appearance of greater fertility, but how far it will be profitable time will tell, and how enduring the rush will show. Locally, much of the rush and its associates have been made into a kind of hay more useful as litter than as nutritious feeding.

On the hill region, of all the zones of vegetation the most noticeable is the belt of woodland which characterises the shore slopes. This belt is not continuous. There is a break at Stuckbeg, on Loch Goil. A considerable stretch near Mulan Iubhair, and another from Corran Bay

FIG. 3.—Flat of Upper Glen Goil looking south, with *Juncus acutiflorus* (jointed rush) dominant. The trees on the flat are on the banks of two ox-bows of the River Goil cut off by the straightening of the channel.

to Mark are bare of trees, and up Loch Long there are a few minor breaks. Several of these breaks occur at places where long ago clachans were situated with their surrounding tilled fields and open spaces for communication with the uplands. The best example of this is at Stuckbeg, but at Mark, Guananbeg, and Coilessan, the same breaks are evident. The belt of woodland is continued up Glen Goil on the western slope of Ben Donich, but it does not pass up Glenmore or down Glencroe, nor is it found in the corries. The upper limit of the woods varies a good deal: 400 feet above sea-level is common, but in a few places 600 feet is reached, such as near Lochgoilhead, and on the eastern slope of Ben Reithe. The limits are nearly as marked on the ordnance map, with the addition that the woods usually send long fingers up the Allts, while scattered patches occur here and there in sheltered places

among the rocks and in the hollows. The usual trees of these woodlands are birch and oak, sometimes almost wholly oak, but generally birch and oak in varying proportions, birch predominating upwards. The steep slopes at Lochgoilhead are clad for about half a mile mainly with alder and hazel, and alder again appears with oak on the slopes above Corran Bay. Pine, larch and other conifers are entirely absent from the woodlands. Ash, holly, rowan and hawthorn occur throughout.

The development of this woodland belt is determined by various physical conditions. The lower slopes of the hill are steeper than the upper, giving a better natural drainage with consequent aeration of the subsoil and absence of peat, a condition more necessary for oak than for birch, which can override peat. The region is one of plentiful rainfall, so that where the soil is of even moderate depth there is always plenty of moisture in the subsoil. This is the essential condition of a tree region. The lower slopes of the hills enjoy greater immunity from the desiccating effect of winds, so that when cut down the woods reestablish themselves more easily than on the upper slopes. The lower slopes are largely drift covered, but with much outcrop of rocky ridges and knolls, over and between which there is much variation of soil depth, soil drainage, and soil moisture. As the roots of birch are surface feeders with moderate demand on moisture, while oak feeds much deeper in the soil and makes a greater demand on moisture, a mixture of birch and oak is a natural combination to cover such a variable surface. The same distinctions are repeated in the area of much moister soil with hazel and alder near Lochgoilhead. But the limit of suitable soil is not reached by the woodland, which, as indicated by the altitude of the bracken, could probably be successfully cultivated up to about 900 feet, that is to twice the present breadth of strip, so that there are other controlling factors—human and animal.

The Allts enjoy greater natural protection from wind effects than the open hillside, so that the trees ascend, the birches usually being found highest about 1100 feet. The faces also of the crags and landslips are full of natural hollows with varying depths of soil and varying degrees of moisture, among which trees manage to grow in suitable sheltered positions, and when once one or two trees have managed to establish themselves, the additional shelter they provide makes it possible for others to grow. Both the common ash and the mountain ash or rowan are frequently found in such positions as east of Cnoc Coinnich and south of Ben Reithe, perhaps the most interesting being the stunted yew-trees of Binnein an Fhitich above Meall an Iubhair, the Mull of the Yew. The presence of the yew-tree here gave its name to the striking headland at the entrance to Loch Goil. The knoll above the point between Long Long and Loch Goil is Meall Daraich, the Oak Mull, although the oak-trees now found there are small, and cling closely into the sheltered hollows.

It is difficult for the woodlands to spread upwards to the region of hill pasture, for the trees are usually eaten down by sheep while they are in the seedling stage. But for sheep-farming the woodlands

would probably rapidly spread upwards to the limit of possible growth.

Whatever may have been the primeval condition of the hill slopes as to trees, and even supposing that the bare aspect of many hills is the work of former inhabitants, the present development of a zone of woodland is mainly due to man's influence at the beginning of last century. The human factor was active up till half a century ago. In the *New Statistical Account of Scotland* (1844-45), we read : "The sides of the lochs are much skirted with oak coppices, adding greatly to their beauty as well as the value of the land. . . . Douglas of Glenfinnart has lately planted a good deal along the south side of Loch Goil. . . . The oak coppices

FIG. 4.—East side of Loch Goil looking north from Beach farm. Note the wood of oak and birch on the steep slope up to 500 feet; the bracken and ling areas above the wood; the gap in wood at Stuckbeg, a centre of former habitation; the small delta at Stuckbeg with shingle.

are cut down in succession every twenty-first year, and are enclosed for the space of seven years. They are twice thinned to admit the free circulation of air, and to encourage the growth of the best shoots. . . . The principal change (as compared with the old Statistical Account of fifty years before) is the great fall in the price of bark consequent upon the peace and the opening of the continental ports. This year the price of the article was £7, 10s. per ton, whereas during the war it was more than double that amount."

This economic position accounts for several things. The restriction of the zone of woodland to about 400 feet is a convenience in bringing down the felled trees to the shore for conveyance by boat. The present small condition of the trees is explained by the past systematic felling of the trees while still young. They are mostly about fifty years old more or

less, and are generally now beyond the coppice stage, approaching the pole forest stage. But it will be many years before they will produce a good square beam. As the oak was the tree wanted for barking, we can understand the present abundance of oak. The following table, based on the *New Statistical Account of Scotland*, 1845, shows the relative value of the woods for the parish of Lochgoilhead, the figures representing annual returns :—

Corn,	£580
Potatoes,	749
Hay,	792
Fish,	420
Woods,	450
Pastures,	7000

The annual return from the woods on Ardgoil is at present nil, except for local fencing purposes, and the loss of the barking occupation seems due to the disappearance of low-paid labour.

Nearly co-extensive with the zone of the woodland, but also extending over the open hillsides up to a much greater altitude, is the zone of the bracken, *Pteris aquilina*, L. Its lower limit is sea-level, its upper limit over the area considered is about 850 feet for the open hillsides, with tongues shooting up the sheltered hollows to 1100 feet.

The bracken fronds which burst through the ground annually, and rise to a height of 3 or 4 feet, spring from an underground root-stock which lives in moist earth at a depth of from 6 to 18 inches. Where the soil is shallow the fern cannot grow well, and if such soil at times becomes dry it will not grow at all. Hence it avoids the tops of rocky knolls and ridges. It dislikes too much moisture, hence it shuns marshes : it requires moisture which is aerated, hence it shuns wet hollows where water may move too slowly. It avoids the acid soil of peat, hence it is absent from bogs. In short, it requires for its best development moderately moist, but comparatively sweet subsoil, which it usually finds on sloping ground, that is, what suits the oak also suits it. The bracken loves light, hence it avoids the shade of the alder and hazel woodland, for the foliage of these trees is dense and lets little light pass to the undergrowth. It flourishes in the oak and birch woods, for their foliage is open and allows much light to pass. It avoids the steep northern slopes of hills, for such are only lit by direct sunshine during short periods. Along the south-west, south, and south-east slopes of the hills in Ardgoil, it is strongly developed, most strongly on the slopes of the drift-filled hollows among the rugged knolls of the southern portion. On the steep northern slopes it is weak and often absent. In Corrie Odhair it is found in a few places only on the slopes on the south side, but is well developed on the north side on the south-facing slopes of Ben Donich. In all those places where the controlling factor is lack of direct sunshine, the place of the bracken is taken by the mountain shield fern, which is strongly developed on some of the hillsides and on the steep banks of allts which face northwards. Strong light kills this fern, so that over many tracts where the bright sunshine favours the bracken, the stronger

fern takes the weaker under its protection to give it the necessary shade. In all such tracts the death of the bracken entails the death of its protégé.

The bracken is a formidable invader of tracts which might be of considerable grazing value. In the full-grown state it is not eaten by sheep, cattle, or horses. It gives too dense a shade for grasses to grow well underneath, and hence during the part of the year when it is not developed, that is up till the end of May, the ground is bare of feeding. It is asserted by the older natives, both of Lochgoilhead and of Arrochar, that the bracken has spread greatly over the hills since their young days, to the detriment of the grazing. The same report comes from time to time from various parts of the Highlands, so that it seems certain that the bracken has extended considerably its dominion during recent years, and occupies extensive areas which could be put to better use, and were so put in past times. In controlling the bracken two factors are important, the human and the animal. Where the bracken is cut every year for bedding purposes it is weakened but not eradicated. If it is cut twice a year, and so prevented throwing out its green fronds, it may be eradicated in about two years. But such a method requires a plentiful supply of cheap labour. The animal control is brought about by the presence of horses and highland cattle. Sheep and ordinary cattle will not touch the young shoots, but they are broken up and eaten, it is stated, by the less dainty animals which, formerly common on these hills, are now scarce.

The greater hillside and glen population of a century and more ago had a controlling influence which is now absent. Hugh Macdonald, in an account of Loch Long written prior to 1857, says: "On the slopes of Lochlong, and especially on the Argyleshire shore, there are abundant evidences of the hateful clearance system. . . . These clearances have been principally effected within the last thirty years. One old man, a respectable farmer, states that within his own remembrance there cannot have been less than 200 human beings living on the hills between the foot of the Cobbler and the opening of Lochgoil." The parish minister of Lochgoilhead, from an examination of the Church Records, has reckoned a population of about 200 living in Glenmore alone about a century ago, where there is now not one inhabitant. The upper allts and corries show frequent ruins of shielings or shelters where the natives tended their herds of cattle at the summer pasture, secured the milk and made cheese, and which will, no doubt, furnish future Donnellys with plentiful examples of the primitive dwellings of a prehistoric race.

About a century ago the animal population also was more numerous. At present only here and there in Lochgoilhead parish is there a small herd of highland cattle. But a century ago Dorothy Wordsworth, in the journal of the tour in Scotland with her brother, recorded how the herds of these animals in Glencroe relieved the desolateness of that glen. If we go further back to the time of Argyle's invasion in 1685, we find that the Marquis of Athol—appointed Lord-Lieutenant in 1685—led his following of Jacobites into north-east Argyle and plundered it. The Campbells of Ardkinglas lost 431 horses and mares, 1449 head of cattle,

and 2187 sheep and goats, and the surrounding possessions of the Campbells met a similar fate. Such an extensive haul of cattle and horses would not be possible now.

The factors as regards the bracken may be stated therefore as follows. The presence of a considerable population, many horses and much highland cattle, kept the bracken areas much smaller than now, and in other ways maintained the soil and its flora in such a condition that, however much we may despise it from the standpoint of modern scientific farming, it formed a relatively valuable inheritance from generation to generation of the native population, and was capital giving tempting annual returns when appropriated for sheep-farming at a time when that method of increasing income became common among Highland lairds. The hillslopes have gradually been balancing their vegetation against the habits of sheep, and stability probably has not yet come about, and this equilibrium, though at a higher level than in a deer forest, is lower than it was a century or two ago.

The next zone of vegetation is that of the heather—the Ling, *Calluna vulgaris*, Salisb.—for none of the other common heathers makes independent zones, or covers considerable areas in this district. Heather starts at sea-level where it covers rocky knolls above the reach of salt water. Its development on the lower tracts of the hillsides is prevented by the woodlands, and higher up by the bracken, but in craggy places with a thin covering of soil and on open gentle slopes where a coating of peat has developed, the heather is common even at low levels. It attains its maximum development over wide areas above the bracken zone from about 800 feet upwards to 1500 feet. It gradually fails in robustness from above 1500 feet up to about 1700 feet, when it ceases to be social in its development, but occurs as a reduced occasional constituent of the vegetation up to 1900 feet. These local limits of altitude mean that heather is dominant over that portion of the area which is south of the pass of the Saddle, but that the tops of the hills to the north of this line rise above the heather area more and more the further north we go. This line of separation is even more important. The heather over the southern section attains a much stronger development than to the north, and somewhat differs in nature. Heather moors are usually subdivided into three classes, the very dry one known as heath, the very wet one known as sphagnum-moor or moss-moor, and the intermediate one known as heather-moor proper. The moors on the southern part cover considerable areas on the tops of ridges, and on well-drained slopes approach the heath type, with less of the other two types. The moors on the north are not nearly so well developed, are seldom of the heath type and frequently of the sphagnum type. The further north we go the less conspicuous does heather become as a constituent in the vegetation: thus Ben Donich is almost heatherless, and we find that among the Arrochar mountains to the north of Glencroe true heather-moors are absent.

Ling in its habit is distinctly a xerophyte, that is, it is protected by the structure of its leaves against rapid transpiration of water. Hence it flourishes in situations which are dry as regards soil condition. This

condition, as Schimper says, "must be accompanied by a prevailing moistness of the air both in winter and summer, so that, besides being restricted as almost wholly a European plant, it attains strong development only where in Europe there is a maritime climate." In a wet soil the ling will only flourish where there is more or less peat in the soil, and peat will form only where the aeration of the soil is so defective that the organic matter derived from the decay of plants, instead of being broken up by bacteria into derivatives of ammonia and carbonic acid gas, breaks up into acids known as humous acids, of which the tannic acid of peat may be taken as typical. The effect of this acid in the soil moisture is similar to the effect of salt on the shore flora, that is, absorption of water by the root system is made very difficult, and hence the ling although apparently growing in soil physically saturated with water is in reality growing in soil physiologically dry. That is, physical dryness and physiological dryness each favours the growth of the ling. There are no examples in the area considered of what may be found elsewhere, that is, a strong growth of heather in a pine wood on sandy soil. In this case the actual dryness of the habitat is the favourable condition. But the approach to this condition in hilly regions is indicated by the strong development of the ling on quartzitic hills. Smith, in his botanical map of Perthshire, has shown how strongly heather moors are developed on the quartzitic mountains of the Rannoch type, and how relatively poorly on the schist mountains of the Breadalbane type. Quartzitic rocks seem also to favour another need of the ling, that is the need for very dilute solutions of mineral food supply. This need for weak food seems to be more easily satisfied on soil derived from quartzitic rocks. As the rocks south of the pass of the Saddle are more quartzitic than to the north, the stronger development of the ling over this area appears to depend on the same controlling factors. It is this rugged quartzitic region, ice-worn and heather clad, which forms in popular parlance the Duke of Argyll's Bowling Green.

It follows from this distribution of the ling that there is some good grouse shooting on the peninsula between Loch Goil and Loch Long, while there is none over the area from Lochgoilhead towards Strachur, and none over the area to the north of Glencroe. Portions of the ling area are burned in rotation annually to enable the sheep to get at the young heather which begins to grow in the following year. The full effect on the development and distribution of the ling of the annual burning and of the pasturing by sheep I have not sufficient data for estimating. In 1845 it was said, "These mountains till of late were covered with black heath, but since they have been chiefly pastured with sheep they begin to exhibit the pleasing appearance of verdure, and some of them are already green to the very tops." This sheep control is probably applicable to the northern part of the district considered, but not to the southern, where the ling is too strong to be eaten down.

Above the heather limit is the zone of grass associations, and on the summits a special group adapted for life on such a desert situation. One of the remarkable features of the flora on the upper hill tracts is the great abundance of plants which can resist drought. Although the

region is one of abundant rainfall, the thinness of the soil on the higher parts above the glacial drift, and the exposure to wind, make a week or two of drought effective in killing off all plants not protected against it. Hence the apparently paradoxical appearance in such a region of much plant-life with xerophytic characters. It would appear that the ultimate controlling factor in these tracts is a period of warm dry weather in the summer.

The summit plants live where life suffers great extremes. They have to endure the full heat of the summer sun, the greatest rigour of winter cold, the full force of the hurricane, and the constant drift of air currents over the summits. When rain falls it quickly drains off, and after a short time little free moisture remains, and weeks of drought may try the endurance of the summit flora. The result is a natural selection of plants specially suited for such conditions. Most general on the four summits is the woolly moss, *Rhacomitrium lanuginosum*, which is here because it is woolly. It appears to act as nurse to the other plants mixed with it, the nursing being the more noticeable the greater the altitude. Next comes the blaeberry, *Vaccinium myrtillus*, which is absent only on Clach Bheinn. The ling is confined to the two lower summits—Clach Beinn and the Saddle. On the higher summits occur the crowberry, *Empetrum nigrum*, and the cowberry, *Vaccinium vitis-idæa*. On the Saddle occurs one of the rushes, *Juncus squarrosus*. Reindeer moss is also common. These plants are dominant plants, growing in considerable abundance and forming a carpet with a surface comparatively even, and nowhere rising much more than an inch or two above the level of the ground.

It seems possible to draw from the foregoing some general conclusions. If left to itself a grass covering—using grass in its old sense of any plant with long thin green leaves—would clothe the hills from base to summit or near the summit. But below 1900 feet the ling begins to show itself, and below 1500 feet is able to oust the grass associations over wide areas. Below 900 feet the bracken ousts the heather or the grass over considerable areas where the soil is suitable, and below 600 feet as a present limit, the woodlands become dominant down to sea-level. Hence there is often found over the lower tracts a mosaic of plant groups in which each has taken up the position best suited to itself. The alternation of these groups over some of the lower areas is very frequent, and becomes as complex and difficult to analyse as the variations in the soil. One typical grouping is a crown of heath on the craggy knolls, bracken on the slopes below, and either rush or bog-myrtle in the more level ground at the foot. Another is frequent up the allts, where bracken or, higher up, ling may dominate on the projecting noses of the winding banks, while rushes fill the hollows. The controlling factor in these cases is simply one of drainage, and a local contour map could be botanically coloured with considerable probability of accuracy.

Over the various zones described there are restricted areas with a local development of a special nature. The distinction between the geographically significant and the botanically interesting must be somewhat arbitrary, but it may be meanwhile granted that when the nature and

extent of a particular plant-development is such as to affect the pasture value of a hill slope, and hence the feeding possibilities of sheep and other animals, such an area has geographical significance. A few examples may be given.

On the south-east slope of Cnoc Coinnich there is a great landslip from about 2000 feet down almost to the woodland belt. Between 1750 feet and 1500 feet the hillside for a distance of about half a mile is covered with enormous masses of detached rock. The shattered condition of the ground allows the rain-water, instead of forming burns, to disappear underground and to come to the surface in springs at a lower level. As a result, the whole tract is well drained. Over this landslip

FIG. 5.—Allt Lounin with Tom nan Gamhna in the background: bracken on the noses of the bank and jointed rush in the hollows between: altitude 700 feet: looking north-east.

the development of the common blaeberry is exceptionally strong. It is dominant in many parts almost to the exclusion of everything else, while in other parts Alpine Lady's Mantle—*Alchemilla alpina*—disputes possession. There is a remarkable scarcity or absence of the plants prevalent elsewhere. Such an area has no pasture value.

On the north-west slope of the same mountain a different development is found on a strip between 1000 feet and 1500 feet of altitude. The moor mat-grass—*Nardus stricta*—is a common constituent of the grass association everywhere up to 1700 feet, but over the tract mentioned it undergoes a stronger development, becoming dominant over the heather, and forming the nearest approach to the Nardus-moor that the district shows. Typical developments of this moor may be seen on the hills south of Glasgow, but over the area considered its characteristic tussocks are small and close together. The pasture value of such a moor is almost nil.

On the north-east slope of the same mountain, above Coilessan, from the woodland strip upwards for several hundred feet, there is a strong development of *Molinia cærulea*, the flying-bent, the first growth of which is closely eaten down by sheep in the early summer before the higher pastures have begun to grow.

In several places beds of rush occur. They are found especially in hollows where a few feet of soil are kept wet by underground movement of water, so that drying-up never takes place. These beds are strongly developed over the long north-east slopes of Tom nan Gamhna and the Steeple Hill. The slopes appear to consist of boulder clay. The dominant rush is the same as on the valley flat already mentioned, the slope of the hillside securing the same necessary water movement underground as is effected in the valley flat by hydrostatic pressure.

These four special areas illustrate the important law that wherever the geographical conditions of an area vary considerably from the average, the plant-life of the area gives a "bio-sum" varying from the normal. The determination of the important term in each of these cases is an interesting but complex piece of analysis for future study.

DENSITY OF POPULATION, SCOTLAND, 1911.

By Geo. G. Chisholm, M.A., B.Sc.

(With Map.)

In this number of the *Magazine* we publish the third of the beautiful maps showing the density of population of Scotland prepared by the Edinburgh Geographical Institute according to the method of Mr. Bosse, according to which, on the one hand, all uninhabited country, and, on the other hand, all urban districts and towns of 10,000 inhabitants and upwards, are left out of account in calculating the density. The method is probably the best that can be devised to make such maps as instructive as they can be made.

The first of the maps referred to, that published in the Royal Scottish Geographical Society's *Atlas of Scotland*, is based on a different scale of density from the other two, and thus does not allow of direct comparison with these. But the results of the 1901 and 1911 censuses are both shown according to the same scale, and the comparison between the two is interesting. Notwithstanding the slackening in the rate of growth of the population of Scotland as a whole, the fact that excited most comment when the preliminary returns of the census were published, the most notable thing brought out by this comparison is the extension of the areas in red, the colour showing the highest density of population. Almost at the first glance the appearance of a new red triangle about the middle of the coast of Fife, with its western side running north from Dysart to Markinch, and its northern side running east from Markinch to Largo Bay, will strike the eye, and that will lead us on to the appearance of a smaller red patch including and surrounding Rosyth, the

extension of the red in Linlithgowshire south-westwards to Whitburn, the much more considerable extension of the red in Lanarkshire south-eastwards to beyond Carluke and Larkhall, and that of the Ayr triangle southwards to Ayr.

All these extensions bespeak chiefly the rapidly growing importance of the mining industries of those parts of Scotland, especially for coal and oil-shale, and of the manufactures associated with those industries, though their expansion affects chiefly the towns with more than 10,000 inhabitants, and accordingly cannot be fully indicated in the map.

But there are indications of increasing density of population in other parts of the map also where this cause of growth is not at work. On the south shore of the Moray Firth, a strip extending from Cullen to Buckie has been raised from the fifth to the seventh or red degree of density (the uninhabited area not being counted in the scale). A strip stretching from Elgin to Lossiemouth and Branderburgh has been raised from the fifth to the sixth degree, and a larger tract round Wick has been raised from the fourth to the fifth place in the scale. Here, unquestionably, we have indications of the prosperity of the Scottish fishing industry, and probably also of the tendency, resulting from the increasing use of steam trawlers, to develop that industry at a few of the more favoured ports at the expense of the minor fishing villages. The Aberdeen district is too important a centre of population from other causes for the effect of this to be seen on the map.

This last observation is a reminder of the fact that, however excellent the principle of construction of a density of population map may be, such maps cannot reveal all the points of interest connected with their subject, and indeed can hardly fail in some respects to convey misleading suggestions. There must always be something arbitrary in the scale, and always something fortuitous in the results worked out by the scale. In the present map, for example, areas differing in density by 63 per square mile may be represented by the same tint, and others differing in density by only 1 per square mile by different tints.

That makes it worth while to examine the figures given in the census report to seek for further points of interest. The examination of that report first of all confirms strongly the conclusions drawn as to the influence of mining and fisheries on the growth of population ; and almost the only other causes of growth that appear to be indicated are commerce and manufactures, as shown by the growth of most of the towns, and the attractions of health and pleasure resorts. If we single out all those parishes in which an absolute increase of 300 in the population in the decade 1901-1911 is equal to an increase of at least $2\frac{1}{2}$ per cent. as parishes that show a notable increase, then we find very few whose rise in numbers cannot be assigned mainly to one or other of the four causes mentioned. On the other hand, parishes depending wholly or almost wholly on rural industries, or on these associated with an ill-equipped fishing industry, in nearly every case exhibit a decline.

The influence of coal and other mining and of manufacturing industry on the growth of population is so marked that it would be tedious and unprofitable to show this in detail. It is enough to point to the most

progressive counties as illustrating this. Between 1901 and 1911 only eight counties showed an increase of population of as much as 10,000. These are in order—Lanarkshire (increase 107,786), Fife (48,894), Renfrew (45,594), Dumbartonshire (25,966), Midlothian (18,866), Stirlingshire (18,712), Ayrshire (13,864), and Linlithgowshire (13,748). The large increase in Fife is significant of the rapid increase in the demand for British coal in Germany, both east and west of Schleswig-Holstein, and in other countries on the Baltic. These also are the only counties in which most of the parishes do not show a decline. In Dumbartonshire the number of parishes with a diminished population is equal to that of those with an increased population, but the decreases are small, the increases for the most part large. With regard to Stirlingshire, it may be pointed out that St. Ninians, which includes a large suburban population of Stirling, advanced between 1901 and 1911 from a population (8152) which was taken into account positively in determining the density of population of the county for the construction of the map of 1901 to one (13,868) in which it influenced that density negatively, that is, had to be deducted from the total population on which that density was calculated.

Besides the eight mentioned, ten counties showed an increase of population between 1901 and 1911, but in most cases the increase was trifling, and in none did it reach 7000 (Aberdeenshire, 6911). The remaining fifteen counties showed an aggregate decline of population. Nearly every parish in Argyllshire except those in which members of the royal navy or navvies, or both, happened to be enumerated in 1911, showed a decrease of population, as did every insular parish in the county without exception. All the six parishes of the county of Bute showed a decline. Roxburghshire parishes decreased in population in 23 cases out of 30. Four out of the five parishes of Clackmannanshire declined. The parish of Alloa, with its seaport, mines, and manufactures, increased somewhat in population, but it may be pointed out that the diminution in the population of the others, due, it would appear, partly to the working out of coal-mines, partly to the effect of competition with the local manufacturing industries on the part of more favourably situated places either at home or abroad, was enough to affect the tint in the map of 1911 as compared with that of 1901.

Of the minor but still considerable towns that show an increase between 1901 and 1911, those which increased by as much as 5000 are confined to the two counties which show the largest total increase. Coatbridge, Hamilton, and Rutherglen, all in Lanarkshire, increased by 6296, 5869, and 5818 respectively; Kirkcaldy in Fife by 5521; Wishaw in Lanarkshire increased by 4390; Falkirk in Stirlingshire by 4289; and Ayr by 4288. No others, apart from the larger towns, increased by as much as 4000. Three burghs with more than 10,000 inhabitants showed a decrease in the last decade, Inverness diminishing by 859, Arbroath by 1750, and Hawick by 426.

In the case of the following parishes, which are wholly or largely suburban, the increases are due to the same causes as those which explain the growth of towns generally:—Strathmartine, a suburb of

Dundee; St. Ninians, as already mentioned, of Stirling; Tibbermore, of Perth; Cadder, Cambuslang, Cathcart, Govan, New and Old Kilpatrick, Renfrew, and Rutherglen, all essentially suburbs of Glasgow; New and Old Monkland, of Airdrie; Cambusnethan, of Wishaw; Dalziel, including parts both of Wishaw and Motherwell; Corstorphine and Liberton, of Edinburgh; Newbattle, of Dalkeith; Troqueer, of Dumfries, this last parish including Maxwelltown, the Kirkcudbrightshire part of Dumfries.

These instances may serve to remind us of the fact that the census returns of towns and cities are often very misleading from a geographical point of view. These returns relate only to municipalities. But in the case of towns, the only information that is of geographical and economic interest is that as to the population of local urban aggregates. As is well known, municipal boundaries often run right through towns proper. It is much to be wished that some means were taken for ascertaining real town populations, so far as possible, as, for example, by enumerating as belonging to a town all the population included within the limits of the area in which there is no break at all, or no break of more than a given length, in the lines of houses. The limits of area would thus be regularly altered from census to census, but there would be nothing misleading in that. It would merely mean that between two census periods the town had grown (or decreased) in area as well as in population.

Even this proceeding, it is true, would not in many cases include the whole population essentially belonging to certain towns, as may be seen from the consideration of the next class of parishes showing an increase of population in Scotland between 1901 and 1911, those which have grown as what may be called pleasure or health resorts. Among these may be mentioned Dunblane, Kilmacolm, Inverkip, Colinton, and Cramond. Of these, the first three have probably grown chiefly through accretions of population belonging essentially to Glasgow, the other two through similar accretions from Edinburgh. Similarly it has been pointed out that Brighton is in a large measure, if not mainly, essentially a part of London.

Attention may be called to one rural parish of Scotland that has increased in population between 1901 and 1911, that, namely, of Girvan. This is no doubt due to the increase of cultivation of early potatoes and other vegetables for the Glasgow market, and if so, it is to be noted as in truth a rural increase and not one of the class referred to in the last paragraph.

If the decline in the great majority of rural parishes is deplored, it should at least be borne in mind that this diminution in population has been accompanied by an improvement in the conditions of life of the farm labourer as regards both housing and wages.

GOLD AND SILVER MINING AND REDUCTION PROCESSES AS RESPONSES TO GEOGRAPHIC CONDITIONS.

By George D. Hubbard, Oberlin College, Oberlin, Ohio, U.S.A.

(*Continued from p.* 426.)

Silver.

Inasmuch as silver is rarely found in gravel and never abundant there, the amount of placer silver-mining is negligibly small. For this reason there is little single-handed mining. Although silver was known in California almost as soon as gold, it was never much worked. It was found in other States nearly as soon as was the gold, and its mining usually followed that of gold. Bancroft[1] thinks that silver-mining was largely prevented in California for several decades because of the abundance and accessibility of the richer metal. It has been suggested that Californians, having worked in gold so long and so successfully, did not care to mine the less noble metal. This may have some weight even yet with the average Californian. It would certainly have had more weight in earlier days. But whatever the mental attitude of the Californian toward silver-mining, it would not interfere with others from the East conducting silver-mining operations there. It is true, however, that California's silver production is very small compared with that of several Western States, and there is probably a good reason for this in the occurrence of the metal. Silver is usually obtained with other metals which bear the expense of mining, but in California, Shasta, the leading county, is the only region where metals other than gold are extracted from the silver-mines. Here copper practically pays expenses, and the silver may be counted as profit. In other places, as far as known, the silver is alone or with gold, and does not occur in rich deposits. It may be said, then, that the mining of silver is not generally profitable, and hence not carried on, in California, because of its mode of occurrence.

Deposits other than superficial, are the chief sources of the metal in the West, hence mining operations and appliances are such as are best adapted to that kind of ore working. The contents of the vein are removed, crushed by stamps or rollers, and passed on to the separating devices. If no other metals occur, the silver is separated from the waste by amalgamation or smelting. But the ore with copper is smelted with its gangue and then separated by subsequent chemical processes. In a similar manner the separation from lead ores is accomplished. When zinc occurs the problem is a difficult one. At Canyon City and Pueblo, Colorado, there have recently been constructed plants for the conversion of such rebellious ores. The process converts the zinc into white oxide for which there is a strong Eastern market. This rises from the roasting ore as a fume having the appearance of white smoke, and is condensed by cooling, after which the ore may be treated for the silver content.

[1] *History of California*, vol. vii. p. 651.

These silver reduction processes are all expensive and more or less involved, requiring capital, labour, fuel, apparatus, and technical skill; but large quantities of ore render their operation both possible and economical.

Special Types.—Two or three special types of silver occurrence and associated reduction plants may well be examined to discover the relation of plant and process to the ore and its surroundings. First in order of time was the Comstock lode,[1] whose development and twenty years of startling history began in 1858, and from which the first silver in Western United States was taken. The metals in this lode occur in quartz along a contact of two igneous rocks where there has been some slipping. The lode is hundreds of feet broad in the widest portion, while it tapers out and divides before disappearing at the ends. Mines have been located along it for two miles. Nothing short of a bonanza, however, could have survived the litigation and physical difficulties in the way of its development. A rocky, parched, barren mountain slope, over a mile above sea-level, deserts all around, only meagre brooks in the main ravines in spring, all of which were dry in summer; water gotten only from lakes twenty miles distant; no timber for buildings or mine support within at least as many miles, and this all to be hauled over sandy or stony roads, and no fuel but scrub nearer than this distant timber; roads cut and blasted through canyons and along ledges and mountain precipices, and out over high Sierra passes, always snow-filled in winter; severe winters, deep snows and high winds; no crops, and very difficult and expensive transportation of food and all supplies from San Francisco: peculiar, irregular, and unfamiliar distribution and occurrence of ore resulting in great loss in developing; inadequate laws and regulations, conflicting claims and confusion of titles leading to enormous and ravaging lawsuits; the mine, as it deepened, flooded with alkaline waters, and hampered with temperatures of 100° to 140° F. and great humidity,—these constituted some of the difficulties. It seemed as if nothing could be accomplished. But so great was the power of glamour and the actual wealth, that many difficulties were overcome, and others were borne while a city sprang up on the site. The population of the territory increased by immigration, attracted by the marvellous reports, until statehood was granted in 1864. Nothing else known in that barren region would have called people thither. Not only did the development of this great lode attract the attention of miners and scientists, but its output disturbed the world's monetary system.[2] When its prime was reached in 1877 and its total production of gold and silver had mounted up to about $300,000,000, its decline came rapidly; for in four years the annual production fell from $36,000,000 to $1,000,000,[3] then rose to two, three, and even seven millions, but fell off again through the last decade to less than $200,000. The cessation of operations at the

[1] *U.S.G.S. Monogr.* iii., pp. 3, 6; *U.S.G.S. Monogr.* iv., pp. 56-76, 86, 190, 203-205, 331-3.

[2] Tarr, R. S., *Economic Geol.*, p. 182; Watson, D. K., *History of Amer. Coinage*, pp. 120-238; Ries, H., *Econ. Geol.*, pp. 494-5.

[3] Lord, Eliot, *U.S.G.S. Monogr.* iv., p. 416.

great Comstock lode was due to a failure of the company to master certain geographic conditions—viz., the mines filling with water faster than the machinery was able to pump it out, and the encountering of high temperature. Thus the water and the excessive heat made further development impossible. The population of the State declined to a point below the statehood limit, and the region reverted to its former wilderness condition. In this mine, some two hundred miles of tunnels have been opened, and wide galleries where the lode was wide and rich. These tunnels are supported by timbers, and the galleries were literally filled with blocks of wood and stone as the ore was removed. All the wood came from the forests some twenty miles to the west over a barren waste of sand and without a railroad. When the mine was apparently approaching prosperity, the supporting timbers caught fire and burned, which necessitated the added expense of replacing them or abandoning parts of the workings. Probably more has been spent in the Comstock region than the total output of the mines would replace. Efforts are now being made to revive the big mine. New pumps and new and repaired machinery are increasing the yield, until in 1901, 1902, and 1903 each the production was over $1,000,000. Since 1903 it has again fallen off to less than $250,000, but has been gradually rising in the last two or three years.

Since the ore is native silver and gold with some argentite, in a gangue of quartz, stamp mills or other ore crushers, and adapted amalgamating pans, are all that is necessary for its reduction. Before the end of 1861, companies to operate such mills to the number of eighty-six, capitalised with an aggregate sum of over $60,000,000, had been organised in the region: and many others followed soon after.[1] The mills were far in excess of the needs of the mines in their best days, and now scores of them are rotting down on their flimsy and too hastily constructed foundations. This enormous waste was due to men under the influence of the glamour and the possibilities of the great lode; and now, sobered by thirty to forty years, we look back and wonder and smile at their delusion.

Leadville,[2] Colorado, forms a second type. Work in this region began in a gold placer in 1860, to which miners rushed from many quarters, and from which was taken several million dollars worth of gold. A flourishing mining town, Oro, sprang up: but when the gold became exhausted its creation, the town, declined. In 1874 the lead carbonate, carrying silver, a weather product of the deeper-lying sulphides, was recognised: and in five or six years its enormous development again gave the region a good rank as a mining centre. The new town, Leadville, grew from a few log-houses, a 10×12 grocery store and two saloons, with a population of one or two hundred in 1877, to a city of 15,000 with $8,000,000 to $30,000,000 assessable property, twenty-eight miles of streets, waterworks, gasworks, schools, churches, hospitals, and fourteen smelters in 1880. The lead carries good values in both gold and silver.

[1] Lord, E., *loc. cit.*, p. 126.

[2] *U.S.G.S. Monogr.* xii., pp. 1-16, 375-6, 614, 636-47.

The ore really is an argentiferous galena bearing native gold and, deeper down, zinc in a gangue of barite, chert, and calcite within a vein along a limestone-porphyry contact. Copper, manganese, bismuth, iron, antimony, molybdenum, and others have been recovered from this heterogeneous deposit; but zinc, silver, lead and gold, usually in the order named, are the best payers.[1] This region contains a greater assortment of metals and more complex associations than almost any other in America. Placer-miners were troubled with the lead carbonate, commonly called heavy rock, in their sluices from the start: and their process was modified to avoid difficulties and dispose of the unknown rock. When its nature became known, and the bed-rock sources were discovered, shaft-mining and mill reduction began. But these carbonates and associated sulphides could not be worked by crushing and amalgamation as were the ores of Comstock; hence, smelters using the dolomitic limestone of the vicinity and the coke from coal-fields a few miles distant were constructed. Crushers were associated with the furnaces to reduce the coarser pieces of ore, but their work was only a minor part of the process.

This second type of silver ore is characterised by its complexity and by large values in lead and zinc, and the reduction plant to be successful must respond to the conditions and become itself more complex. Lead- and zinc-mining are profitable here, because the silver and gold occur with them and may be added to the output with little expense. The decline in the price of silver recently aided in closing a number of the Leadville plants. So intimate is the relation of ore and process that neither lead nor zinc can be recovered unless silver remain above a certain figure.[2] Lead is a rather common associate with silver in several Western States, notably Utah, Idaho, and Washington. The famous Eureka of eastern Nevada is also classed here.[3]

A third type is that of Butte, Montana. This region began as a gold- and silver-mining centre, but has become the greatest copper-producing region in the world, with large quantities of gold and silver as by-products. The ores, as now worked, are mainly copper sulphides with some galena and blende in a quartz gangue with moderate values in silver and gold. The mines are situated along veins cutting the granite knob upon which Butte is situated, and their product is smelted at Butte, Anaconda, and Great Falls. The output in 1906 was as follows—copper about $55,000,000, silver $7,000,000, gold $1,250,000, and lead $51,000. The ore cannot be treated as is that of either of the above types, nor can it be mined in the same way. The geographic conditions and associations of the silver require specifically different processes. Furthermore, no such hardships and difficulties have to be overcome in the two latter types as in the first. Early transportation difficulties have been overcome by the construction of railroads. Fuel is near in both cases, timber is abundant and good, the water supply is adequate, and water in the mines is easily

[1] *U.S. Dept. Treas. Ann. Repts. on Prod. of Precious Metals*, 1903 f.
[2] *Ibid.*, 1900, p. 115; Tarr, R. S., *Econ. Geol.*, p. 235.
[3] *U.S.G.S. Monogr.* vii., p. 64-79.

controlled. The Butte association of silver with copper is common in Utah and Arizona.

Table I. (p. 424) shows a marked change in the relative amount of silver recovered from each of the three types of ore. This partial desertion of the quartz ores for the copper ores is due, in part, to the discovery of the new and more closely adapted metallurgical processes required by the more complex ores, and, in part, to the association of two or more by-products with the silver whose value with that of the silver makes possible, with similar outlay, a total production of metal of greater value than that possible in the pure quartz-mining.

Summary.—Not many of these deposits which are now yielding in the aggregate by far the major portion of our silver, could be operated at all for the silver alone. Hence it is due to its association that the silver output is what it is. On the other hand, when the price of silver declines or the ore values in silver fall below certain figures, certain mines must shut down, curtailing the supply of copper, lead, or zinc at the expense of the factories using these metals. In each of these three types, the metallurgical processes used depend upon the associated minerals; and the general problems met vary with the supply of timber, water, food and transportation.

In all the mining processes discussed the influence of the geographic conditions, including both telegraphic relations and mineral and rock associations, have aided in determining—first, whether the deposit shall be worked at all or not; second, what processes shall be employed, *i.e.* whether cradles and toms, dredges, stamp mills or smelters; and third, what problems of transportation, supplies, and materials must be met, and how they are to be solved. It is true that man's knowledge and skill are important factors all through the general problem of extraction and reduction of the precious metals; but it is equally true that the closer man causes his machines and processes to conform to the natural requirements, the greater his success; and that the ruins of plants and dismantled machines all over the West proclaim the fate of apparatus and process that is not a response to the conditions.

DENUDATION AND EROSION IN THE SOUTHERN APPALACHIAN REGION.

A MONOGRAPH with this title forms Professional Paper 72 of the U.S.A. Geological Survey publications (see also vol. xxii. p. 383), and contains many facts interesting both from the geographical and economic point of view. The author is Mr. L. C. Glenn, and the investigation was undertaken primarily with a view to studying the effects of deforestation and the consequent erosion of the steep mountain slopes, both in the mountain region itself and in the surrounding areas.

From the Virginia-North Carolina line the Appalachians extend southwards 250 miles to northern Georgia, where their ridges almost die away, but further south-west they rise again and extend some distance

into Alabama before finally disappearing. The mountains rise from a base that ranges in elevation on the south-east side from 1000 to 1200 feet above the sea, and on the north-west side from 900 feet in north-west Georgia to 1600 feet on the Tennessee-Virginia line. The mountain belt proper is really an elevated plateau, walled in on its western margin by a higher mountain range from which numerous short spurs project out upon its general surface. Here and there on the plateau are other short isolated ranges, one of which, the Black Mountain Range, includes Mount Mitchell, which rises to an elevation of 6711 feet, and is the highest point east of the Rocky Mountains. More than forty peaks rise above 6000 feet. Almost a hundred square miles are above 5000 feet, and almost half the North Carolina portion is above 3000 feet in elevation. Part of the eastern edge of the plateau is marked by peaks that rise above its general surface level, and part by an abrupt escarpment that overlooks the Piedmont Plateau to the east. This eastern edge of the mountain plateau region is called the Blue Ridge. The general surface of the mountain plateau has been carved by streams into a multitude of hills and minor ridges, and in this region most of the highest areas lie between the headwaters of adjacent major streams, where erosion is and has always been least efficient in lowering the general surface level.

The mountains generally have well-rounded soil-clad slopes that show softened outlines. Only here and there do they present abrupt slopes and sheer precipices of bare rock. The profiles are the flowing curves that are characteristic of mature or old mountains rather than the abrupt lines of young mountains.

The rocks of the region are principally gneisses, schists, and granites, but include smaller areas of quartzites and limestones, especially in the western part, and volcanic rocks in the northern part. All are ancient, and in many places they have been much folded, crushed and distorted, or have been broken and faulted. In the course of the movements that produced the distortions many new minerals have been formed in the rocks by chemical rearrangement, or have been brought into them in solution by circulating water or gases, and deposited in cracks and fissures. Not only are all the rocks ancient, but they have been so long exposed to weathering that they have been deeply rotted, and in most of the region the residual material covers the solid rock, forming in places a layer many feet deep. The disintegrated rock, when protected from erosion, absorbs much of the rainfall, and afterwards feeds the water slowly to the streams, thus regulating the stream flow by preventing floods when heavy rains fall, and excessively low water when dry seasons come.

The region is drained by a multitude of streams which flow to the Ohio, the Tennessee, the Gulf of Mexico, or the Atlantic, and the drainage is so far-reaching that the flow of the streams directly affects the industries and welfare of the people in much the larger part of the south-eastern United States. Most of the small headwater streamlets rise high on the steep mountain sides, flow in narrow gorges, and descend in a few miles by a series of falls and rapids to an elevation of between

2000 and 3000 feet, where they unite to form larger streams, which, as a rule, flow without much additional fall across the middle part of the plateau in broad, open valleys, with gentle to steeply rounded slopes, but which invariably cut deep narrow gorges through the chain that forms the western rim of the mountain plateau. Most of the small tributary streams in the middle part of the plateau have a considerable fall. In consequence there is a considerable amount of water-power in the region.

The entire region, with the exception of a few high "balds" and an occasional steeply rounded scarp or precipice of bare rock, was originally covered with forests which were remarkable for the extraordinary size and height and the wonderful variety of the trees. About seventy-five per cent. of the area is still forested, but large areas have been recklessly stripped of their trees. In regard to the nature of the trees, around the southern end of the Appalachians short-leaf yellow pine forms a considerable part of the forest, but elsewhere the cover consists of walnut, cherry, poplar (or tulip), oak, chestnut, hickory, and many other species on the lower and middle slopes; beech, hemlock, and white pine on the higher slopes: and spruce and balsam at greater heights. The trees are larger and more perfect on northern slopes and in coves, where the soil is moister, deeper, and richer. On southern slopes the soil is likely to be drier and to contain less humus, and consequently to be less fertile. The forest there is more open, and both the trees and undergrowth are more stunted. The southern slopes, especially along the Blue Ridge, are in many places steeper also, and these characteristics all combine to make them more liable to erosion. On lands once cut over reproduction of the forest is generally rapid, provided the soil layer has not been removed by erosion before the new growth has had time to establish itself. In a similar way abandoned fields, if they have not been denuded of their soil, rapidly become covered with forest again. The southern Appalachian forest forms to-day the largest and most valuable hardwood area left in the United States.

As to climate, the average rainfall in the northern and north-western parts of the region is in places only 40 to 50 inches a year, but on the south-eastern slopes of the Blue Ridge the annual rainfall is greater than in any other part of the United States except the North Pacific coast. The average rainfall in this part of the southern Appalachians is 70 to 80 inches, and the yearly maximum exceeds 105 inches. The rainfall is not uniformly distributed throughout the year, but reaches a maximum either in July and August, or, less commonly, in February and March. In summer much of it is torrential in character, and the downpours may continue several days. Not unusually it rains twenty or twenty-five days in a month, and a month's precipitation may reach or exceed 30 inches, and the rainfall in a single day may be as much as 9 inches. In winter a considerable amount of the precipitation is in the form of snow, and by its slow melting this snow, which remains on sheltered slopes for some time after it has disappeared from the valleys below, aids greatly in regulating the stream flow.

The climate of the region is much cooler than that of the Atlantic

slope to the east or the Mississippi valley to the west—it is not, however, the same throughout the entire mountain region. Areas close together may differ in elevation by more than 5000 feet, and their average temperatures show corresponding differences. On the higher peaks the vegetation is of the Canadian type. The northern part, in North Carolina and Virginia, is considerably colder, even at the same elevation, than the southern end, in Alabama. The southern and south-eastern slopes are sheltered by the higher crests and chains from the cold waves from the interior of the continent, and have a milder and more equable climate than have the north-western slopes, which are more exposed to cold waves, and hence show greater temperature variations than the south-eastern slopes. In summer the temperature may fall as low as 40° on the mountain tops, or may rise to 75°, 80°, or 85° in the valleys. From December to March the temperature anywhere in the mountain region may drop below zero for a day or two at a time, and minimum temperatures of −10°, −15°, and −19° are recorded for the region. The mean monthly winter temperatures for stations at elevations between 3500 and 4000 feet range from slightly below the freezing-point to several degrees above.

The population, which averages from thirty to forty to the square mile, is largely agricultural. In the higher mountains grass grows well, and grazing is an important industry. Much of the cleared land there is kept in grass, and so is preserved from washing badly, but some of the cleared slopes are so steep that, even though kept in grass, they soon erode to the bare rock and become useless wastes. During prolonged wet weather the turf and soil become thoroughly softened, and on steep slopes the trampling of the cattle breaks the turf and starts small landslides which quickly develop into gullies. When land is cleared for agricultural purposes it is cropped in a reckless and extravagant fashion, so that its fertility is quickly exhausted, and with the loss of the porosity of the surface soil erosion begins and the field is abandoned. When the clearing is intended for grazing, crops are first taken off it before it is put down to permanent grass. With care, if the land is not too steep, such mountain grazings may be made to last for an indefinite period, but ignorance and neglect often lead to their destruction. It is this waste of land which necessitates continual clearing of new lands, and is leading to the ruthless destruction of the forest.

The region is rich in minerals, and the working of these aids erosion in various ways. First, the demand for timber for pit props leads to forest destruction; again, the waste of the mines is discharged into the streams, and furnishes débris which may be spread by flood-water over agricultural lands; finally, where copper ores are roasted all vegetation may be destroyed for a radius of several miles, and the denuded surface is eroded with great rapidity.

In regard to erosion the author notes that in forested areas surface erosion is reduced to a minimum. The streams rising from such areas show a very much slower rise after heavy rainfall than those from cleared areas, but they continue in flood for a much longer period, because of the retardation of the surface run-off by the leaves and litter of the

forest. Even at their highest such streams are only slightly discoloured, and carry but little suspended matter. As soon as the surface is cleared of forest, however, a great change occurs, though in this case the geology exercises a marked influence. When the surface soil is loose and open, so as to permit the water to permeate it readily, the flow of water is largely underground, and the erosion is minimal. Such soils, however, with their resistance to erosion, are rare in the region, and most soils waste rapidly. The erosion takes various forms. The least obvious is what is called sheet-wash, that is the gradual removal of the surface fertile soil, without the production of obvious channels. This occurs especially on compact close-grained soils, and is so slow and gradual that farmers fail to perceive it, and believe that their soils have become exhausted, whereas, in point of fact, they have been worn down to the sub-soil. More obvious is the gullying of the surface, which occurs in loamy soils, and is exceedingly rapid in its action. Some striking illustrations are given of the formation of gullies, and it is noted that though they form on slopes their effects may be felt on the level, where fertile tracts may be overwhelmed by waste from above. Further, once started a gully extends upwards as well as downwards, and may destroy forest lands above by undermining the trees. Another form of erosion originates in landslides, often caused by the trampling of cattle on steep slopes after rain.

As to methods of checking erosion, prevention is certainly the best. Generally, it may be said that no slope steeper than 15° should be cleared, but the nature of the soil affects the matter so much that even this slope may erode badly in some districts, while steeper slopes are untouched in others. Cleared land should be terraced, a plan practised only to a limited extent in the region. A covering of grass is a good preventive to erosion, but in the hotter and drier regions this is difficult to maintain. Where erosion has already occurred on a steep slope, it is found that its further progress may be arrested by covering the surface with straw, leaves, or forest litter, held in position by brush. This mechanically protects the soil, and allows a covering of weeds and briars to establish itself. As soon as this takes place wind-borne seeds start a new forest growth on the denuded slope. The resultant natural re-afforestation is usually rapid, and is, of course, much cheaper than planting.

As suggested in the foregoing, reckless methods of clearing are greatly increasing the farmers' difficulties in the southern Appalachians by destroying the surface soil. It is interesting to note that this reckless exploitation is also having effects far outside the region. The author shows that the rivers which arise in the mountains have been greatly modified by the increasing rapidity of erosion, for this gives their waters a heavier load to carry, and leads to the silting up of the lower navigable reaches. Further, the changes in the run-off are making floods more frequent and more destructive. The whole report, which has many illustrations from photographs, shows what far-reaching consequences the reckless destruction of mountain forests may have, and how necessary forest regulations are in the interests of the community at large.

KNOX'S CEYLON.[1]

THIS new edition of Knox's *Historical Relation of Ceylon* contains much fresh and interesting matter. In a too brief preface, the editor tells us that last year the late Mr. Donald Ferguson discovered Knox's autobiographical notes and some additional manuscript hidden away in a copy of the *Historical Relation* in the Bodleian Library. These have been embodied in the volume now before us. From the biographical notes we learn that Knox was born on Tower Hill in 1641, his father being a seafaring man. He received a pious education from his mother, which did not however prevent him indulging in slave-driving and occasional piracy in later life. He commenced his seafaring career in 1655, and it was in his second voyage, *i.e.* in 1658, that the disaster occurred, when, as he says, "I lost my father & myselfe & the prime of my time for businesse & preferment for 23 years till Anno 1680." And truly during the twenty years of his enforced sojourn in Ceylon he seems to have experienced evil times at the hands of a capricious, cruel, savage, tyrannical Rajah, while he dwelt miserably among a people of whom it may truthfully be said that morals they had none and their manners were beastly. During his journey home after his escape, he prepared the well-known account of his captivity and his observations about Ceylon, and strange as his story often is, its general truthfulness need not be doubted, as much of it has been abundantly verified by later evidence and investigation. His manuscript was submitted to the famous Sir Josiah Child, who practically ruled the East India Company during the latter half of the seventeenth century, and who fortunately was wise enough to estimate Knox and his work at their true value. It is a remarkable book, and the writer of the preface in no way exaggerates its attractions when he says, "He has in this History given you a tast of his Observations. In which most Readers, though of very differing Gusts, may find somewhat very pleasant to their Pallat. The Statesman, Divine, Physitian, Lawyer, Merchant, Mechanick, Husbandman may select something for their entertainment. The Philosopher and Historian much more. I believe at least all that love Truth will be pleas'd: for from that little Conversation I had with him I conceive him to be no ways prejudiced or byassed by Interest, affection, or hatred, fear or hopes, or the vain-glory of telling Strange Things, so as to make him swarve from the truth of Matter of Fact."

From the manuscript discovered in the Bodleian by Mr. Ferguson we learn that on his arrival in England in 1680, Knox was welcomed by his relations, and, what was much more to the purpose, by "the Comitty" of the East India Company, who granted to him the beggarly sum of £20, for which, however, he at the time was very grateful. His misfortunes had not quenched his seafaring instincts, and after going through a course of mathematics to improve his nautical knowledge, he offered his services to Sir Josiah Child, a commercial grandee of whom

[1] *An Historical Relation of Ceylon*, by Robert Knox. Glasgow: James MacLehose and Sons, Printers to the University, 1911. Price 12s. 6d. net.

Macaulay has left us this delightful portrait. "In wealth, and in the influence which attends wealth, he vied with the greatest nobles of his time. There were those who still remembered him an apprentice, sweeping one of the counting-houses of the city. But from a humble position his abilities had raised him rapidly to opulence, power, and fame. Before the Restoration he was highly considered in the mercantile world. Soon after that event he published his thoughts on the philosophy of trade. His speculations were not always sound; but they were the speculations of an ingenious and reflecting man. Into whatever errors he may have fallen as a theorist, it is certain that, as a practical man of business, he had few equals. Almost as soon as he became a member of the committee which directed the affairs of the Company, his ascendancy was felt. Soon many of the most important posts, both in Leadenhall Street, and in the factories of Bombay and Bengal, were filled by his kinsmen and creatures. His riches, though expended with ostentatious profusion, continued to increase and multiply. He obtained a baronetcy; he purchased a stately seat at Wanstead; and there he laid out immense sums in excavating fish-ponds, and in planting whole square miles of barren land with walnut-trees. He married his daughter to the eldest son of the Duke of Beaufort, and paid down with her a portion of fifty thousand pounds." Such was the merchant prince who gave to Knox the command of the *Tongueene Marchant* in which he sailed for Tonquin in 1681, when he secured a rich cargo with which he returned to England. In 1686 he again sailed in her to Madagascar or St. Laurence to get negroes for St. Helena, and he had also a roving commission to find suitable harbours in the Tristan d'Acunha group, and to proceed to the East Indies for general trade. Storms and hurricanes drove him to the island of St. Laurence, where he found civil war going on between the sons of the late king. Here he was again captured by treachery, but succeeded in escaping with his ship to St. Helena. There, however, his sailors made off with his ship, and he returned on another vessel to Plymouth, where one of the first ships he saw was the *Tongueene Marchant*. He had a cordial welcome from Sir Josiah Child, and presently collected sufficient means wherewith to start as a buccaneer, or, as he put it, he was "bound now for Bumbay with the King's Commission under the great Seale of England to make war against the Grand Mogoll & his subjects. & to take all Ships and vessalls belonging to them as I should meete in my passage thiather & the Company added to my number 30 soldiers, so that I carried out 63 men & had 24 guns. This designe pleased me very well being very sutable to my present Circumstances, haveing but little Stocke to trade with, and this in all appearance seemed a ready way to raise my decayed fortune haveing a full power by the Kings, as well as the Companies authority, to take booty from the Indians which I knew were not able to make any Considerable resistance tho my force were small, & would not suffer my thoughts to wade far into the Equity & Justnesse of such Actions since my Commission according to human law would beare me out." In this new career he had various vicissitudes, but on the whole he had considerable success. In 1694 he had a serious quarrel with his patron Sir Josiah Child because he declined to take

command of a new ship invented by Sir Josiah, which Knox thought unfit to face the storms incidental to an eastern voyage. Later on he was offered, but refused, the lucrative post of Chief Factor at Ispahan in Persia. In 1697, having had four years of "an idle droneish life," Knox again offered his services to Sir Josiah Child, but on this occasion met with so decided a repulse that he resolved to go to the other extreme, and become "an interloper" or private trader in defiance of the rights or pretensions of the East India Company. So in 1698 he sailed in the *Mary* for Surat; but any chance of success in this enterprise was ruined by dissensions among those in charge of the ship. After this disappointment Knox decided to encounter no more risks and to stay quietly at home. He died, a fairly rich man, in 1720.

Obviously we may not apply to Knox a standard of character which would be suitable to the present day. A sincere and devout Christian, he saw no harm in slavery; a stouthearted patriotic Englishman, he had no hesitation in capturing and plundering the vessels of French or Dutch or Persian, powers which, in the East at any rate, might safely be assumed to be at war with England. There can be no doubt but that he was a man of quick and accurate observation, and considerable tact and skill in dealing with savage Eastern rulers and people, and was naturally affectionate and kindhearted to his own people and comrades, and thoroughly loyal and honest to his employers. In estimating his character and work we must not forget that the best part of his life, *i.e.* from the age of twenty to forty, was spent in enforced idleness during his miserable captivity in Ceylon. The editor of this very interesting work has exercised remarkable self-restraint in the matter of notes and explanations, allowing the author to speak for himself.

GEOGRAPHICAL NOTES.

Europe.

The Tree Limit in Sweden.—M. Charles Rabot discusses in *La Géographie* the evidence for the lowering of the tree limit on the mountains of Sweden in geologically recent times. It has already been shown that both in the north and south of Norway the upper limit of the Scots pine (*Pinus silvestris*) has retreated by some 1300 feet in post-glacial times. Some recent work in the mountainous regions of Sweden seems to show that there also the forests of pine are steadily retreating down the mountains, and have been doing so since post-glacial time. Many trunks and parts of trees have been found in bogs and lake deposits far above the present forests, while in the upper regions of the existing forests the trees are dying and are not being replaced by young plants. The evidence seems to show that in Sweden there has been a shrinkage of the pine area since post-glacial times of from 490-800 feet. Formerly the pine occupied the whole birch zone, and even extended upwards beyond it, but it no longer thrives in this region. The birch also is showing some shrinkage, but much less than the pine, and the fir

seems to be unaffected. As to the cause, human agency is excluded by the fact that cattle are not pastured near the upper limits of trees, nor do the people cut firewood there. The reason seems to be climatic, and is the result of a lowering of the summer temperature since post-glacial times, a lowering which is believed to measure about $4\frac{1}{2}^{\circ}$ F.

The Coast Erosion Commission.—In July 1906 a Royal Commission was appointed to inquire and report as to the encroachment of the sea on the coasts of this country, and as to what means are desirable for the prevention of such damage. Later the scope of the Commission was enlarged to include afforestation. Two portions of the report appeared some time ago, the first, containing the minutes of the evidence heard in the earlier part of the inquiry, in 1907, and the second, dealing with the subject of afforestation, in 1909. The final report, issued this year, contains the findings of the Commission, and thus includes some points of geographical interest.

The Commissioners find that there is a considerable amount of erosion and consequent loss of land taking place on certain parts of the coast, but on the other hand land is being reclaimed from the sea. Taking the last thirty-five years it was shown by the evidence of the Ordnance Survey Department that 6640 acres have been lost, while 48,000 acres have been gained by the reclaiming of tidal lands. This reclaimed land is due principally to the accretion of material brought down in suspension by rivers. The amount and rate of erosion along the coast is governed by the nature and form of the coast. The natural protection of the coast is afforded by accumulations of sand and shingle derived almost entirely from the material eroded from the cliffs. The amount of beach material therefore depends upon the amount of erosion going on, and the quantity is limited, and is not inexhaustible.

The eroded material travels along the coast in definite directions, due to the action of the waves, the winds, and the tides. Its travel may be arrested by projecting headlands and river mouths. Much damage to the coast has been produced by the removal of this beach material in some places for road-making and constructional purposes.

The evidence shows that if works of protection are carried out with due regard to the local peculiarities of the district to be dealt with, and on sound engineering lines, erosion of the coast may be prevented. The fact is also disclosed that a very large amount of money has been wasted on groynes, sea-walls, and other defence works, owing to a want of knowledge of the conditions prevailing in the neighbourhood where the works were carried out; also that works designed solely with regard to the protection of a particular line of coast may lead to increased erosion on the coast to the leeward side, owing to the stoppage of the travel of the beach material. If the land to be protected is ordinary agricultural land, the cost of protection may be greater than the value of the land to be protected.

The Commissioners go on to make various practical suggestions, notably that the Board of Trade should form a central authority in the United Kingdom for the purpose of sea defence.

Africa.

Geophagy in West Africa.—The practice of geophagy, or the eating of earth, is known to be somewhat widely spread both in tropical America and Africa. The phenomenon has been studied in some detail recently by M. Henry Hubert in the French Sudan (*Bulletin du Comité de l'Afrique française*, mars, 1911). The interest of this particular case is the systematic way in which the earth is obtained, and the fact that the practice occurs in a region which is well cultivated and where food is abundant. The particular region is a place called Diekuy in the south of the Upper Senegal and Niger Colony, and not far from the Ivory Coast and the Gold Coast, both regions where the practice has been previously described. As is usually the case, the earth consumed is a clay, which is found intercalated among the grits of the region in beds of varying thickness. Near the village one of these beds crops out at the surface in the form of an isolated hillock, some 65 feet high. In addition to being used for consumption, the clay has another use as a lubricant, for the women rub their fingers with it when spinning. The surface clay does not appeal to the native taste so much as the deeper layers, and in consequence they dig galleries in order to obtain clay of better quality. The methods of mining adopted are very primitive, and therefore falls of earth take place frequently, often with fatal results. When this happens no attempt is made to rescue the victim, for it is believed that an annual victim must be sacrificed to the divinities of the mine. The clay so obtained is both used for personal consumption and as an article of trade. The traffic in this singular article is carried on within a radius of about twenty miles, and the individual consumption among the richer classes is enormous, as much as seven and a half pounds per day being eaten. The custom seems to be widely distributed in the Sudan, and in some instances it is only the women who practise it, while elsewhere both sexes do so.

America.

Irrigation in Canada.—According to *Nature* a scheme of irrigation was inaugurated four years ago for supplying water for agricultural purposes in a district in Canada near Calgary. The area of the district to be irrigated covers three million acres, and the scheme involves the construction of 4500 miles of canal, of which 1500 miles have now been completed. The main canal is 17 miles in length and 120 feet wide at the water-level, and is supplied from the Bow River. Storage is provided by a reservoir three miles long by half a mile wide, with a depth of 40 feet. The total cost of the whole work is estimated at three million pounds. In other parts of Canada also extensive irrigation works are in progress, especially in the fruit-growing districts of British Columbia. In this district the rainfall ranges only from 9 to 10 inches as a maximum, falling to as little as 2 inches in dry seasons. Without irrigation the land in this dry district would be worthless. The area of Canada which is being opened up for fruit-farming by irrigation extends over 30,000 acres.

The Altitude of Mount Huascaran.—In vol. xxvi., p. 205, we published here a note communicated by Mrs. Bullock Workman on the results of a triangulation of the two summits of Mount Huascaran, made by her instructions. We have now received the official report of the expedition which conducted the triangulation. The report is published under the title of *Détermination de l'Altitude du Mont Huascaran*, and is published by Henry Barrère at Paris. It gives full accounts of the work of the expedition, and is accompanied by plates and sketch-maps. The actual results of the triangulation were given in our previous note.

Natural Vegetation and Crop Possibilities in the Great Plains.—A note in a recent issue of *Science* (July 14, 1911) summarises the contents of a leaflet published by the U.S.A. Bureau of Plant Industry, which discusses the question of the conclusions in regard to the capabilities of land for crop production which may be deduced from its natural covering of vegetation. The region dealt with is that of the Great Plains, where the difference of rainfall causes the prairie grass formation to pass westward into the short grass formation of the plains, and some interesting geographical conclusions arise out of the observations made. The author, Mr. H. L. Shantz, finds that three associations may be distinguished in the short grass areas.

(1) On the "hard lands," where the soil consists of loam or clay, two species are dominant. These are grama grass (*Boutelova oligostachya*) and buffalo grass (*Buchloe dactyloides*). The hardness of the soil here only permits the rain to penetrate a short distance, little more than twenty inches after the heaviest rains, and in consequence the roots of the plants do not penetrate more than twelve to eighteen inches. During June and July, when the rainfall is relatively heavy, the high nutrient content of the soil causes a luxuriant growth, checked later, as the available water supply diminishes in late July and August. When such land is cultivated it produces heavy crops in favourable seasons, but failures are frequent.

(2) On sandy soils, or at least those intermediate between the sand-hills and the hard lands, wiregrass (*Aristida longiseta*) predominates, but is accompanied by prairie turnip (Psoralea), a plant of the Leguminosae family. Here the texture of the soil permits the rain to penetrate to greater depths, and deep-rooted plants become possible. The roots of the wiregrass are from two to three feet long, and those of the prairie turnip penetrate to five feet. As however there is nothing to exclude shallow-rooted grasses, at least in favourable seasons, species of grama grass often occur also. The soil here is sufficiently compact to prevent blowing, but the loose surface layer diminishes loss of water. The nutrient value of the soil is high. Such soils are very suitable for cultivation, for while in good years their yield is not far below that of the previous type, the risk of failure in bad years is less.

(3) The third association occurs where the soil is loose and sandy. Here the water content is high, but the nutrient content low, and the surface is liable to be blown. Water is preserved here in two ways, the loose surface prevents any appreciable run-off, while it also forms

a mulch which diminishes surface evaporation. Such land is occupied by bunch grass (*Andropogon scoparius*), whose roots penetrate to four to six feet, as do also those of its most frequent associates. The density of the bunch-grass affords a fair index of the conditions as to water and salts, and where the cover is fairly close the conditions are relatively favourable. Such land has the advantage that crop failures are rare, but at the same time in good years the yield is low as compared with the two other types.

Such an investigation is of great interest as suggesting that modern methods of plant study may enable the geographer to ascertain the probable value of uncultivated lands without previous experiment.

Polar.

The German Antarctic Expedition.—We noted here on p. 315 that the *Deutschland*, the ship of this expedition, left Germany in May for Buenos Ayres and the south. Accounts have now been published of the voyage to the Azores, giving details of soundings which have been carried on, and stating that the ship was proving very well suited for the purpose for which she is intended. The vessel expects to reach Buenos Ayres during the present month (September). Lieutenant Filchner, the leader of the expedition, did not leave Germany with the ship, but was expected to reach Buenos Ayres in August.

The Climate of Spitsbergen.—A short note in a recent issue of *La Géographie* quotes from a Norwegian journal the interesting fact that a Norwegian hunter found ripe berries of *Empetrum nigrum* (the crowberry) in Southern Spitsbergen last summer, and brought several examples to the Bergen Museum. The discovery is interesting because it is the first time that ripe fruits of this plant have been found in the region, though they occur in the peat deposits. The supposed non-ripening of the berries is one link in the chain of argument which has been used to prove that the climate of the archipelago has become more severe since post-Pliocene times. It is however believed that though this particular argument proves to be unsound, there is still sufficient evidence to show that at the close of the glacial period the climate was warmer in Spitsbergen than it is at present.

General.

An Agassiz Memorial Gold Medal.—It is announced in the *Popular Science Monthly* for July that during his visit to Washington at the time of the annual meeting of the National Academy of Sciences, Sir John Murray, K.C.B., F.R.S., presented a fund of £120 to the Academy for the purpose of founding an Alexander Agassiz gold medal, which is to be awarded to men of science in any part of the world for original contributions to the science of oceanography.

International Association of Seismology.—This Association met at Manchester on July 18-22, the opening address being delivered by

Professor Schuster. There was a reception in the Town Hall on one of the days of meeting, which was well attended, and a dinner was given by the University on the last evening. Saturday, July 22, was given up to excursions, and at the invitation of the Director of the Meteorological Office, and Mr. and Mrs. Walker, nearly twenty foreign delegates visited the new magnetic and meteorological observatory at Eskdalemuir. Prince Galitzin was elected president, and Mr. Lecointe vice-president, for the next period of three years, dating from April 1912.

In his opening address Professor Schuster, among other topics, discussed the bearing of recent discoveries in regard to radio-active substances on the older theories as to the temperature of the earth's interior. A few sentences may be quoted from his address: "In our youth we were taught that the earth, once a molten and fiery globe, had gradually cooled down, leaving the inside still hot, but gradually cooling and contracting. This contraction of the nucleus was looked upon as the primary cause of geological dislocations. But how do we stand at present? In the breaking-up of radio-active products we find a source of heat which—if the amount of radium and thorium in the interior of the earth is not decidedly less than that which is found near the surface—would not only balance the earth's loss of heat by radiation, but actually increase its average temperature. Though reasons may easily be found why the surface layer of the earth may be richer in radio-active products than the core, I think that we are nevertheless driven to the conclusion that the earth is now, and has been for a long time, in thermal equilibrium, and that shrinking by cooling does not account for any of the more recent displacements."

Modes of Life in Human Geography.—Professor Vidal de la Blache is contributing to the *Annales de Géographie* a series of articles entitled *Les Genres de Vie dans la Géographie Humaine*, which, though they do not lend themselves very readily to the purpose of a summary, contain many suggestions of great interest. The central idea is that man affects nature and nature affects man chiefly through the intervention of the animal and plant world. As all recent work tends to show, there is a struggle for existence among plants and among animals, no less than between plants and animals. In this secular struggle man intervenes, and it is by his power of inclining the fortunes of war this way or that that he finds for himself a place in nature, to the detriment of pre-existing plant or animal associations. Where the climatic conditions are such that all life is impoverished, then his choice of means of existence is small, and life becomes precarious. But even in such climates a relatively stable organisation may occur. The stability of the Lapp social polity, based only upon the reindeer, and that of the Eskimo, based solely upon the chase, afford marked contrasts with the instability of the life led by the Fuegians, and induce the author to believe that the two former must have originated, not where they persist, but in the continental area which extends over middle latitudes in the Northern Hemisphere.

On the other hand, where the conditions greatly favour plant life at all seasons, man's power of winning a place for himself is greatly handi-

capped. The paucity of human societies in tropical forests is an example. But in some tropical regions the occurrence of a well-marked dry season, *i.e.* of a periodical check alike to plant life and to insect life, gives to the incipient human society its chance of obtaining the mastery. This suggestion leads to an interesting treatment of the part played by the seasons in enabling man to subjugate nature.

But if the seasons in many regions impose a periodical check on man's adversaries, any secular alteration of climate may similarly enable him to find a place for his cultivated plants and domesticated animals in the midst of the closed associations which oppose them. This leads to the interesting suggestion that the marked progress which has taken place in the northern countries of Europe and America, especially during the last centuries, has been influenced by the earlier changes due to the passing away of the glacial period. Further, if it is true that differences of climate have become increasingly marked in the geological periods which approach the existing one most nearly, we are justified in saying that, with an increase in variety, the world has also increased in intelligence.

The author then goes on to consider the various areas of the surface where man began his attack because they offered him special advantages. Such were forest clearings, the shore area between the forest and the sea, river banks, mountain regions, and so forth.

This brief summary may serve to call attention to a paper well worth the attention of the anthropogeographer.

The International Review of Hydrobiology and Hydrography.—We have already drawn attention here to the establishment of the *Internationale Revue der gesamten Hydrobiologie u. Hydrographie*, now in its fourth volume. But we note with interest that with the last issue, forming parts I. and II. of vol. iv., a change appears in the list of editors, owing to the addition of the names of Sir John Murray, Mr. E. M. Wedderburn, and Professor Herdman of Liverpool. At the same time the issue has been considerably enlarged, and a considerable portion of its contents are published in English. Thus we have no less than three original articles in that language, as well as a considerable number of notes and summaries. Among the articles we notice one by Mr. E. M. Wedderburn on lakes and oceans, in which the author points out the probability that seiches may occur in the ocean as well as in lakes, and should be sought for there by the same methods as in the case of lakes. The occurrences of such seiches would account for certain observed peculiarities in regard to the distribution of density in the sea. In another article Mr. James Murray discusses the methods to be used in the observation of tides and seiches in frozen seas. Among other articles is a very instructive one in German by Herr H. Lohmann on the Nannoplankton, that is on those minute forms of life in the ocean which have hitherto largely escaped notice. During the *Michael Sars* expedition such forms were obtained by centrifuging small quantities of water, and this is the most effective method of obtaining specimens. A very interesting conclusion which emerges from Mr. Lohmann's study is that both in the marine and freshwater plankton unicellular animals are much

fewer in number than unicellular plants and multicellular animals. He explains this on the supposition that while the unicellular body is of great advantage to the plant, with its special mode of nutrition, the animal's mode of nutrition demands better developed sense organs and motor apparatus than can be obtained in a unicellular organism.

These few notes may serve to call attention to the work being done by the *Internationale Revue* in a sphere where many interesting possibilities are opening out.

The International Geographical Congress.—We have received the programme of the excursions to be made from October 23 to November 1, after the holding of this Congress in Rome. Of these the first or northern excursion is to the lower valley of the Po and the Fore Alps. The starting-point is Ferrara, where the delta of the Po will be examined and a steamer journey on the river undertaken from Pontelagurasco to Mantua. Verona will then be visited, and the lakes of Garda and Iseo. The valley of the Serio will be traversed, special attention being paid to the development of industries here, and the use of water-power. From Bergamo the lakes of Como and Maggiore will be crossed, thence the party will descend to Milan, where various scientific and industrial undertakings will be visited. On the way to Turin the town of Novara will be examined. The total expenses of this excursion will not exceed 380 Italian lire, and the objects of study will be physical and economic geography. Participants will be presented with a monograph of the delta of the river Po, with maps, especially prepared by Prof. Mario Barrata of the University of Pavia.

The second excursion is to Naples, Palermo, and the coasts of eastern Sicily and Calabria, and will be devoted to physical geography and vulcanology. The party is to meet at Naples, where a day will be devoted to the sights of the neighbourhood, a choice having to be made between the three following:—Vesuvius and Pompeii, the Phlegrean Fields, Capri. On the 24th October the party will start by steamer for Palermo, travelling next day to Catania, where Mount Etna can be ascended or a tour made round its circumference. Thence the ruins of Messina and Reggio and the rebuilding of these towns will be examined. From Reggio excursions will be taken to the neighbouring coastline to inspect the effects of the earthquake, and a return will be made to Messina, where the steamer will be taken to Naples again. This excursion will not cost more than 358 lire.

The third excursion is a variant of the preceding, but gives more time to Naples and its vicinity. It allows three days for Naples, and joins up with the other excursion at Catania. The cost will be about 366 lire. All excursionists are invited to visit the exhibition at Turin on November 1, and on the evening of that day the excursions will be regarded as closed. Application for admission to any of the excursions should be made to the Secretary of the Congress, Via del Plebiscito, 102, Rome, not later than September 15.

Commercial Geography.

Trade of Madagascar.—The report for the year 1910 on this subject (*Diplomatic and Consular Reports*, 4713) gives some interesting facts in regard to recent changes in the trade. One of the products of Madagascar which has only entered into the world's trade within the last few years is tanning bark from the mangrove. The trees yielding this bark grow plentifully in the northern and western districts of Madagascar. When the industry was begun in 1905 the bark was obtained entirely from Nossi-Bé, in the extreme north-west, in which province the mangrove-trees covered 80,000 acres. So rapidly, however, have these been cut down or destroyed that at the beginning of 1909 only trees of less than 13 inches in circumference (the cutting of which is prohibited by law) remained growing. Operations are now being carried on in the adjoining province of Analalava, which contains 50,000 acres of mangrove-trees, averaging 1000 trees to the acre. This new industry furnishes occupation to the inhabitants of a region in which employment was formerly difficult to obtain. There is a local demand for the timber of the mangrove, for house and boat-building, but the destruction of trees for the sake of their bark far exceeds the local demand for the timber.

Madagascar is beginning to recover its former position as a rice-exporting country. Ten years ago (in 1901) no less than 26,160 tons of foreign rice were imported, but in 1910, 6587 tons were available for export.

Manioc enters largely into the native diet, but prior to 1910 had never entered into the export trade. In that year, however, the failure of the potato crop in France led to the importation of manioc as a possible substitute in the manufacture of alcohol and glucose, and as a cattle food. Its content of saccharine matter was found to be so high that a great demand arose, and the price of the product in Madagascar rose from £1 to £3 per ton. The result is that manioc is being extensively planted by the natives.

Another new industry which seems to be prospering is that of ostrich rearing. At the beginning of 1910 there were 230 birds in the island. Feathers to the value of £1038 were exported in 1910. As a result of these new industries the exports in 1910 showed an advance of 36 per cent. as compared with the previous year, while imports diminished by 2 per cent.

NEW BOOKS.

EUROPE.

Elementary Regional Geography: Europe and the Mediterranean Region. By J. B. Reynolds. London: Adam and Charles Black, 1911. *Price* 1*s.* 4*d.*

This is an excellent little book, well and carefully written, and giving a simple and accurate account of the region with which it deals. It is intended for children in the upper classes of elementary schools and the lower classes of

secondary schools, and is well and suitably illustrated, with many sketch-maps as well as with illustrations from photographs. We cordially recommend it to the notice of teachers.

Schottland und seine Bewohner, mit einer Karte; Skizzen und Studien nach einer Reise. Von Direktor Dr. Walter Suck. Oschersleben: Verlag von Gebrüder Köppel, 1911.

This is a sixty-page pamphlet, containing an extremely well-informed and pleasantly written account of a summer holiday spent by the author—a teacher—in Scotland. Arriving in Leith from Hamburg, the party began their tour in Edinburgh, and the first thirteen pages contain a very intelligent description of the "sights" and historical associations of the capital. The German point of view comes out in the references to the Forbes Mackenzie Act, and the difficulties met with in attempting to get a modest refreshment on a hot Sunday after a walk through the streets and squares. The next chapter deals with the lowlands and Glasgow. Here the author gives his views of Scottish church and school arrangements. The criticisms are mostly in a friendly tone, and those few which might be called "strictures" are in the main just and fair. The Burns country and the Scott country were next visited, and the author's pages on these districts would form an excellent guide-book to similar parties.

In the chapters on the Trossachs and the Highlands and Islands the author gives evidence of an intimate acquaintance with our Scottish literature. The beautiful scenery, and the characteristics of the various classes of the people are justly appraised, and the pamphlet is full of interest, not only for Germans who intend to visit Scotland, but for Scotsmen who wish to know the real impression which our people make on a fair-minded foreigner.

Letters from Finland. By Rosalind Travers. London: Kegan Paul, Trench, Trübner and Co., 1911. *Price 7s. 6d. net.*

Finland is not a country that has attracted travellers or tourists from Great Britain to the same extent as Norway or Sweden, doubtless partly from a fear of espionage by the Russian authorities; and with some reason, as the author and her cousin "Celia," after some eight or nine months' residence, had to beat a rather hasty retreat to Denmark to avoid capture by the Russian authorities in Helsingfors, for having expressed approval and sympathy in society with the Finns in their political relations with Russia.

These letters of Miss Travers are written in a most attractive style, and her delightful descriptions of the scenery could not be surpassed. She had also better opportunities than most travellers, for she saw the country in its winter aspect as well as its summer, and having relatives there she saw a great deal of the inner life of the people.

Of Lappmark, the northern part of Finland, she saw little or nothing, as railways are not yet running in these regions. The country is flatter than Swedish Lapland on the other side of the Gulf of Bothnia, though similar so far as its rivers and endless lakes are concerned. Of the two, Swedish Lapland seems preferable and much more advanced.

It is interesting to learn that "a number of old Swedish families" in Finland, like those in Sweden, "have purely Scottish names," though they are now all Finlanders, and thoroughly identified with the country.

Miss Travers is a practised writer, and her book will well repay perusal, not only for its account of the country, but also of the wonderful progress its people

have made in education and arts. The only sad thing is the crushing power of the Russian government as expressed in their designs for the Russification of Finland.

Description of Arthur's Seat Volcano. By B. N. Peach, LL.D., F.R.S. Memoirs of the Geological Survey of Scotland. Edinburgh: Printed for His Majesty's Stationery Office, 1911. *Price 6d.*

In our review of the Geological Survey Memoir on the Geology of Edinburgh in the June issue we mentioned, on page 309, that the chapter on Arthur's Seat was to be published separately. This has now been done, and the present pamphlet, which is accompanied by a geological map of Arthur's Seat on the scale of six inches to the mile, brings Dr. Peach's study of the subject within the reach of practically every one. The pamphlet should have a very large sale, especially in Edinburgh. It is reprinted from the Memoir with only some trifling changes.

Roma e Dintorni. Guida Speciale con Piante della Città e Carta dei Dintorni. Novara: Istituto Geographico de Agostini, 1911. *Prezzo L.* 1.50.

This is a capital little guide, which may be recommended to those who intend to visit Rome during this the Congress and Exhibition year. The plan of the city is in three sheets, so that it can be readily folded to show any particular quarter, and is very clearly printed, the tramway lines especially being well shown. The text contains a great deal of practical information in small bulk, and has a list of important streets, squares, etc., and another of the monuments. The excellent map of the surroundings, with the brief description, will enable the tourist to extend his excursions to the neighbouring country.

La Haute-Loire et le Haut-Vivarais. Par Marcellin Boule. Paris: Masson et Cie, 1911. *Prix 4 francs 50.*

The latest volume of the Boule Guides has been a labour of love to the general editor. It is divided into two parts, a monograph on the district—its history, geology, industries, etc.—and a tourist guide, in which scientific information receives prominence. It is compact, handy for travel, and has over one hundred illustrations and maps.

A Guide to Chamonix and the Range of Mt. Blanc. By Ed. Whymper. With Illustrations and Maps. Sixteenth edition.

The Valley of Zermatt and the Matterhorn. By Ed. Whymper. With Illustrations and Maps. Fifteenth edition. London: John Murray, 1911. *Price 3s. net each.*

We welcome the present season's issue of these invaluable guides. As usual, the author adds a page of new notes to each, the most interesting item of information given in these being that on September 15 to 16, 1910, thirty-four cows crossed the Théodule Pass. This should be consoling to timid mountaineers who may wish to cross the Pass during the current season. The lists of guides have been revised, and various changes in hotels, time-tables, etc., are indicated, so as to bring the books up to date.

By Fell and Dale at the English Lakes. By Rev. H. D. Rawnsley, Canon of Carlisle. Glasgow: James Maclehose and Sons, 1911. *Price 5s. net.*

Canon Rawnsley's name is honourably associated with the National Trust for Places of Historic Interest and National Beauty, and of all districts he has by his

numerous writings made the English Lakes specially his own. In his latest book he discourses genially on many aspects of the district—its personalities, scenery, geology, antiquities, etc., and the small volume ought not to be overlooked by visitors to this unique countryside. Sexton Joe, he tells us, "would talk by the hour of the wonderful John Peel and his laal pony." Eight characteristic illustrations are included.

Nooks and Corners of Old England. By Allan Fea. New Edition. London: Martin Secker, 1911. *Price* 10*s.* 6*d.*

Mr. Fea's book is full of odd and interesting information, and though not always well expressed, it makes excellent reading. The following quotation with reference to Market Drayton is a sample of its lore. "The sovereign remedy they had for whooping-cough is worth remembering as it is so simple. All you have to do is to cut some hair from the nape of the invalid child's neck, place it between a piece of bread and butter, and hand the sandwich to a dog. If he devours it the malady is cured; if he doesn't, well, the life of the dog at least is spared." The illustrations are numerous and good, and any tourist in England would be well advised to consult the index as to the places he means to visit. The arrangement of the book according to counties is a convenience.

Through the Alps to the Apennines. By P. G. Konody. London: Kegan Paul, Trench, Trübner and Co., Ltd., 1911. *Price* 12*s.* 6*d. net.*

This is an account of a tour in a motor car through the hill towns of Italy. To some extent it is a reprint of articles which have appeared in certain periodicals, but the greater part is original. But although primarily an account of the tour, and though a great deal of the letterpress is taken up with the minor vicissitudes of the journey, it would be a mistake to consider that the book is only of interest to motorists. For it takes the reader through a part of Italy not easily accessible to the ordinary tourist, a region of surpassing historical and artistic interest. To all intents and purposes, the journey begins at Genoa, through Lucca, Pisa, Volterra and so on through the land of St. Francis. To motorists there is a suggestive hint of disaster to the tyres encountered in driving through the marble country on the road to Lucca. We have heard of a similar experience in the same place, where all the tyres were cut to ribbons. The writer is really a lover of Italy and has a strong artistic sense. The illustrations are excellent, notably the colour drawing by Mr. Robert Little, R.W.S.

ASIA.

Changing China. By the Rev. Lord William Gascoyne-Cecil. Fourth Impression. London: James Nisbet and Co., 1911. *Price* 3*s.* 6*d. net.*

This is a cheap edition of a work now well known, and accordingly it is enough to say with regard to it that it is really important that this work should have been rendered generally accessible. The author is a man of insight and sympathy, and it is a great advantage that, by the publication of this cheap edition, a work in which we are told, for example, that though "the reader may be inclined to smile at the idea of China being in a higher moral condition than Europe so as to be able to react on her beneficially" yet "stranger things have happened"; and that "the Chinese have perhaps a greater right to be called civilised than we have on this side of the world," should be brought within reach of a larger number of that section of the reading world to which this book is primarily

addressed, that section, namely, which is chiefly interested in the Christianisation of China. This, Lord Gascoyne-Cecil thinks, may be most advantageously brought about by the establishment of a University in China to impart Western knowledge in a Christian atmosphere.

Sinai in Spring: or the Best Desert in the World. By M. J. Rendall. London: J. M. Dent and Sons, Ltd. *Price* 4*s.* 6*d. net.*

This is a book which should encourage many who are anxious to get away from the beaten track, and to visit with comparative ease a country of supreme and abiding interest. Mr. Rendall, now headmaster of Winchester College, describes in simple language how, starting from Suez, he was enabled to explore a great part of the mountain range called Mount Sinai, and be back in Suez within sixteen days. The Children of Israel, it is to be supposed, starting from Ayun Musa, eight miles from Suez, "went three days into the wilderness and found no water," but Mr. Rendall took the steamer to Tor, the great quarantine station, where he was virtually at the mouth of the Sinai range. Here he was fortunate in having an introduction to Dr. Ruffer, the president of the quarantine camp, who provided him with all that he required, and set him on his journey. There follows a most interesting account of the journey into the heart of the range, the visit to the Convent of St. Catherine, and the return to Tor, the study of which will reward any one who wishes to visit "the best desert in the world." There are many useful hints as to clothing and food, and in the appendix there is a short résumé of the present position of the "Sinaitic Question."

The West in the East. By Price Collier. London: Duckworth and Co., 1911. *Price* 7*s.* 6*d. net.*

In the *Magazine* for June of last year we reviewed with much pleasure the brilliantly able work of M. Joseph Chailley, *L'Inde Britannique.* In the volume now before us we have a thoughtful and instructive appreciation of the same subject at the hand of Mr. Price Collier, a distinguished American, well known as the author of *England and the English.* But a detailed comparison of the two books would be unfair. M. Chailley devoted twenty years to the study of his subject. Mr. Collier spent only one year in the East, and from internal evidence in the book it appears that the year was not wholly devoted to study; for in India, as the guest of officials and native chiefs, he naturally spent a considerable part of his time in sport and other entertainments. Moreover, it appears that within the year Mr. Collier also visited Hong-kong, Canton, Japan, and Manchuria. M. Chailley's work was written primarily for the instruction of the French Colonial Office. Mr. Collier tells us that in this work he attempts to deal "with the external and imperial relations of Great Britain, because as Americans we are vitally interested to know how soon, and to what extent, we are to be involved in imperial matters in an even graver measure than now." He recognises that the United States by the annexation of Cuba and the Philippines have definitely assumed a place among the competitors for commerce and power in the Far East, and that from that position they cannot now resile, even if they wished to do so. No one in this country will be disposed to cavil at Mr. Collier's remarks and criticism of British rule in India. Evidently, in the short time at his disposal, he made excellent use of the many opportunities he had of observation and acquiring information; he has noted some of the many difficult and complex problems which are inseparable from the government of our great dependency, and much of his criticism is well worth consideration. He recognises to the full that much of the

difficulty of ruling India now comes from the ignorance and worse which prevail in some quarters at home. Exception could easily be taken to some of his economic and financial principles and theories as he applies them to India, but such a discussion is outside of the scope of this *Magazine*. He has a well deserved and evidently sincere appreciation of, and admiration for the devotion, ability and skill of the present administrators of government from the Governor-General downwards, although he repeats the somewhat threadbare accusation that the Indian civilian officials are deficient in sympathy for those whom they govern. Nevertheless Mr. Collier has written a shrewd and useful little work, so far as India is concerned, and one which will, undoubtedly, be of much use for the purpose for which he intends it. It is, however, different when he comes to write of Japan. Here he is a disciple of his prolix fellow-countryman Mr. Putnam Weale. Like him, he is a pronounced Russophile, and although he does not expressly admit it, he is an equally pronounced Japophobe. Probably Japophobe is not the right word; he does not fear Japan; he dislikes it, profoundly mistrusts it, and thinks it is much over-estimated in Great Britain. "It is (he tells us) a poor country, the natural wealth of the country is small, and it is overcrowded; competition is severe, and the old rule of unquestioning loyalty is everywhere lessening; and the new laws of economic competition, both at home and abroad, come into existence, and there follows chaos. . . . Japan has not our morals, our manners, our dress, our religion, our familiarity with wealth and luxury, our tastes in art, literature or music, none of our European traditions in short, or our familiarity with the written or spoken language of ancient and modern culture and civilisation. The nation, which in its own clothes, in its own home, and in familiar surroundings, and living by its own moral code, was dubbed graceful, polite, gentle, and unassuming, is now, because judged by an entirely different standard, awkward, immoral, self-conscious, bumptious, and dishonest. . . . In the case of the Japanese, the whole nation is trying to appear to be what it is not; they are trying to do things which are not natural to them; trying to assume an equality with others along lines that are foreign to them; and although these efforts are prodigious, and here and there successful, the general result cannot help being slightly ridiculous." But here again we are dealing with matters which are outside of the scope of this *Magazine*. In conclusion, we cordially recommend the perusal of this work to our readers. They may not subscribe to everything that is advanced, but from the first page to last the book is interesting, thoughtful, and instructive.

Adventure, Sport, and Travel on the Tibetan Steppes. By W. N. Fergusson, F.R.G.S. London: Constable and Company, Limited, 1911. *Price* 16*s. net.*

In his preface to this interesting and well-illustrated work Mr. Fergusson explains how he came to write what is really the story of two journeys in China and Tibet made by the ill-fated Lieut. Brooke. On the death of Brooke in 1909 the task of telling the story of his travels would naturally have fallen to his comrade, Mr. C. H. Meares, but the latter was unable to undertake the work because he was engaged in collecting transport in Siberia for Captain Scott's Antarctic expedition. Mr. Fergusson, however, had been with Brooke during a part of his second journey, had special knowledge of the localities, and had more or less conducted the investigation into the circumstances of his murder, and thus the task of compiling the narrative from Brooke's diaries and papers was confided to him. We hasten to add that he has executed it faithfully and successfully; he has written a most interesting narrative, the first five chapters of which are

taken directly from Brooke's diary of his first journey into Tibet. This book has a special and pathetic interest, as it records in simple and sympathetic language the story of the brief career of a promising and unfortunate explorer and geographer.

After the conclusion of the Boer War, Mr. Fergusson tells us, Brooke left the army, and in 1903 he was one of a party of four who made an adventurous and dangerous journey from Nairobi to Mount Elgon and thence to the western shores of Lake Rudolph. Undeterred, or more probably stimulated, by the hardships and excitement of this expedition, Brooke prepared himself for further serious work by going through a course of surveying, etc. In 1906 he was thwarted by the Government of India in an attempt to enter Tibet with the object of investigating the relation of the Sanpo to the Brahmaputra. Nothing daunted, Brooke resolved to try again, proceeded to Shanghai, and thence to Siningfu, via Hankow, Singan, and Lanchow. There he had the good luck to meet the Dalai Lama of Tibet, who had fled from his capital on the approach of Younghusband's expedition. Brooke's account of the interview is interesting. "We bowed as we entered the door, and again when we approached the Dalai Lama. We then placed the light blue scarf or Kata (always presented on such occasions in Tibet) into his lordship's hands, and he presented us with another. He gave me a small image of Buddha. Mr. Ridley received a bundle of joss-sticks and a roll of Lhasa cloth. The Dalai Lama asked if we had come far, and while Mr. Ridley explained who we were, I had an opportunity to look round. The room was about thirty feet long, by fifteen wide, and the walls were draped with beautifully worked embroideries, representing Buddha and various deities. The room was well warmed, and a mysterious scent of incense pervaded the atmosphere. The Dalai Lama sat in front of us, cross-legged, on silk cushions which were placed on a table about four feet high, so that his feet were on a level with our faces as we talked with him. His face did not show the slightest trace of expression; he greeted us with a slight forward movement of his body, but nothing like a smile ever approached his face as we conversed. Dr. Sven Heden says that he had never seen such a gentle pleasant face as that of the Tashi Lama, and I can say I have never seen such a hard, expressionless face as that of the Dalai Lama. One could not help thinking that he must have trained his features to resemble the unsympathetic emptiness of the brazen images of the country. He asked if I had come from the other side of the world, and if the English king had sent me to meet him. Mr. Ridley told him that the English were a kind people, and that he was sure that if he would come to India to meet them and learn to know them he would not mind their coming to his country. After about half-an-hour's talk, which was mostly on our side, I asked if I might photograph him, but he refused. With a low bow we backed out of his presence; as we backed his features relaxed into a faint smile, a great relief after our grave interview. So ended our audience with the Dalai Lama, his first, I believe, with an Englishman."

The second attempt to reach the Brahmaputra was also unsuccessful, for although Brooke succeeded in pushing his way to within two hundred miles of it, he was stopped by the Tibetans and compelled to return back. From Siningfu he travelled down the Yangtse to Shanghai, and varied his experience by a trip to Manchuria and Japan. His last journey, Mr. Fergusson tells us, was the result of a conversation with him regarding some almost unknown tribes in the province of Zechwar, among whom Mr. Fergusson had spent some time between 1903 and 1907, when he was an agent for the British and Foreign Bible Society. In January 1908 Brooke was joined by Mr. C. H. Meares at Hankow, and the main part of this book is devoted to an account of their travels and adventures in com-

paratively unknown and savage regions. Late in the year they reached Ningyurnfu on the borders of Lololand, where they were hospitably entertained by American missionaries. From there Brooke, disregarding the fact that the Lolos were restless and excited, as they had lately been engaged in war with the Chinese, started alone with two interpreters and some carriers, marching north-east to what he had been told were friendly Lolos. Those indeed with whom he first came into contact were more or less friendly, but in a few days he entered the district of a chief A-heo, who promptly picked a quarrel with him and made extortionate demands. What followed was this. "The attitude of A-heo and his followers did not inspire the party with confidence, and the interpreter said that they intended to rob them from the first. Brooke tried to show him that it was impossible for his party to run away with all his coolies and things, and that he would surely pay him what he had agreed to on reaching the next chief, who had been friendly on their way up. They seemed to have some little talk over the matter of paying in advance, and Brooke in a friendly way put his hand on the chief's shoulder and put the other on his own pocket, trying to show by signs that he would surely pay him the money himself on arrival at the home of the next chief. Whether A-heo-labow understood Brooke's meaning or whether he took it as an insult it is hard to say, but I think he resented Brooke's freedom, as no one is supposed to lay their hands on a chief or on his clothes. Instantly drawing his sword, he struck a blow at Brooke's head, which he caught on his left arm, receiving a bad cut, and aroused by the treacherous assault, he drew his revolver and shot the chief. Seeing what he had done, he fired two or three more shots in the air, and the chief's supporters all slipped off into the jungle and disappeared." Brooke and his party then fled for ten miles to the house of another chief, by name Suga. "When Brooke and his interpreter reached Suga's house they reported what had taken place, and offered the chief 600 taels if he would get them safely out to Chinese territory. This he promised to do if they would give up the rifle. Believing the chief to be friendly Brooke gave him his rifle with the promise of being safely escorted to Yueh Hsiting, but no sooner had he done so than their pursuers were upon them and they were surrounded. Brooke tried to get on the top of the house, but was knocked down by a stone. Suga, who was a brother-in-law of the chief A-heo-labow, who had been shot, let his men help the A-heo people—according to their law he was bound to—and the whole party were soon cut to pieces. Brooke kept his men together to the last, and died bravely trying to defend them." So ended disastrously a most promising career. The narrative, however, indicates, that although endowed with indomitable courage and considerable tact, Brooke was very rash, and he was badly handicapped by his ignorance of the languages and customs of the peoples among whom he travelled.

We must add that Mr. Fergusson has much interesting information to give us, especially about the religion, manners, and customs of the little known Mantze and Lolo tribes, and also about the fauna of the regions through which the party passed; but for this we must refer our readers to the work itself, which we heartily commend to their perusal. The illustrations are excellent, and there are two useful maps.

Strange Siberia: Along the Trans-Siberian Railway. By Marcus Lorenzo Taft. New York: Eaton and Mains. *Price* $1.00 *net.*

This is a brightly-written account of a journey from China to St. Petersburg, the voyage across Siberia being thus performed in the reverse direction to that to which we are accustomed. The author, an American, was accompanied by his

wife and child, and in place of travelling straight through Siberia stopped at various cities on the route, and also made excursions to a certain number of places off the direct line. Many details in regard to the journey are given which will doubtless be of use to other travellers who may wish to follow the same route, but the geographer will find little that is new in the book, which is chiefly of interest as a record of travel.

AMERICA.

Argentine Plains and Andine Glaciers. By Walter Larden, M.A. London: T. Fisher Unwin, 1911. *Price* 14*s. net.*

Mr. Larden's book is in two main sections; the first part deals with life on an estancia in the plains, the property of the author's brother, while the second deals with an expedition into the Andes. In addition to these there are some interesting notes on the fauna and flora of the Argentine. The first part of the book is, we venture to think, the fuller and more attractive, giving as it does a very minute account of life and work on an estancia, and the numerous photographs help to make things plain to the untravelled reader. A period of twenty years had elapsed between two visits paid by the author to his brother's estancia, and it is of interest, to any one who cares for Argentine affairs, to note the wonderful progress which had been made in the interval, both as regards cultivation and stock-raising. This progress may be taken as a fair index of what is going on on other estates under British management, and it appears to be due chiefly to the labours of the Italian immigrants, of whom there are about half a million settled as colonists, according to the census of 1904. Those who come from the North of Italy are known in the Argentine as *Italianos*, and those from the South are called *Napolitanos*. Of these the former class make the best colonists. Their industry, Mr. Larden says, is wonderful, and they take to agricultural work as the Spanish Americans did to hunting and stock work. On the estancia Santa Isabel, the large estate which is the subject of a number of chapters, the tendency was for the land to revert to the coarse native grasses, unless worked under crops for four years. Hence the proprietor let the land to the colonists for this period, and sowed alfalfa (lucerne) with their last crop. The colonists gave one-fourth of their produce to the estanciero in lieu of rent, and they moved on at the end of four years to pastures new. On pages 51 to 53, a table is given showing the changes brought about in twenty years by the labours of the colonists who had ploughed and prepared the land; a useful system apparently for the estanciero, although it is pleasing to notice that the Italians also do well on their own account. Labour is dear, and, in harvest time, 10s. to 12s. a day, besides food, have to be given in order to attract the men from other work. As regards prospects for emigration from this country, Mr. Larden says, by way of warning, "Argentina is not (yet at any rate) a country suitable to the English emigrant of the usual emigrant class. With regard to this statement, I will simply say, 'Ask any Anglo-Argentine.' No English Emigration Society should send its clients, the overflow of crowded England, there. The Italian peasantry can emigrate there in masses, and will do well; but for the Englishman it is a country for individual enterprise, not for wholesale peasant emigration."

Mr. Larden has some interesting things to relate about the gaucho, or native peon class. He says that estancias are springing up belonging to married Englishmen, and that the estanciero now takes more care of his peons and their families than was formerly the case, and the tendency is for the gauchos to become more civilised than they were formerly. The great improvement which has taken place

in the breeds of cattle also contributes to a better state of things. "The cattle work is being humanised. The animals are no longer knocked about as they were ; they are too valuable, and hence the peon's work is far less brutal than it was."

The large English estancieros appear to be on the whole a very prosperous class ; but the author's remarks convey the impression that in the Argentine, as in other new countries, they are rather too much confined to the pursuit of purely material well-being.

"The history of a locust invasion" gives an idea of the enormous damage done by the hordes of insects ; but the author consoles himself with a theory that even locusts may have their uses in the economy of nature, and that their dead bodies and excreta may have kept the Argentine plains in better condition than they would have been without this invasion.

Mr. Larden, who is an old mountaineer, gives an interesting account of his journey to the glacial region at the head of the Rio del Plomo, but we have not space to refer to this in detail. The text is illustrated with a large number of excellent photographs taken by the author. Those which show the lassoing of cattle and horses are especially worthy of notice.

A Fisherman's Summer in Canada. By F. G. Aflalo. London : Witherby and Co., 1911. *Price* 5*s. net.*

A book by Mr. Aflalo was noticed as recently as our June issue, but his varied and pleasant writing is always acceptable. His latest volume will be of interest to the angler whether or not he proposes to visit Canada. If he does, the details about hotels, bait, guides, etc., will be useful. If not, he will at least have the pleasure of reading how in Fish Lake two rods in a week secured 1300 trout, averaging apparently about 1 lb., or of other waters where "anything under 30 lbs. is contemptuously called a grilse." Though touching upon the Pacific Slope, Mr. Aflalo is chiefly concerned with Eastern Canada, where he vainly pursued the mighty tuna. Besides fishing, he has something to tell us of such natural wonders as the Reversible Falls of St. John, of the inhabitants, *e.g.* the descendants of the loyalists who trekked north after the Declaration of Independence, and of Canadian prospects. The photographs are well reproduced, and there is an index.

The South American Series: Uruguay. By W. H. Koebel. London : T. Fisher Unwin, 1911. *Price* 10*s.* 6*d. net.*

Uruguay is the smallest, and probably the least known of the South American republics on the east coast of the Atlantic Ocean ; and its history has been deeply and grievously affected by its geographical position. It lies between the upper and the nether millstones of Brazil and Argentina, and for many years was the cock-pit in which the Spaniards and Portuguese fought for predominance. Not quite a century has elapsed since it shook off the rule of Spain, only however in a very short time to fall under the thraldom of the Portuguese. Then followed a long period of struggles and wars for independence, with which the names of such national heroes as Artigas, Rivera, and Lavalleja are inseparably connected. This ended in 1829, and was followed in its turn by a period of intermittent internal war and revolutions, which it would be rash to say is now ended. Our readers could desire no safer or more competent guide than Mr. Koebel in his interesting sketch of the history of this troubled and miserable time, and he concludes it by saying : "In 1907 Doctor Claudio Williman succeeded Señor Batlle. The first years of his tenure of office passed in tranquillity ; but at the end of 1910, the

Blancos became active once more, and various actions were contested ere the Government troops once more obtained the mastery of the situation in January of 1911." In brief, throughout the greater part of their history when the Uruguayans were not fighting with external enemies they were fighting with each other. Notwithstanding this ominous and disconcerting state of affairs, we are informed that some forty-four millions sterling of British capital are invested in Uruguay. The country is essentially a pastoral one. The capital, Montevideo, is the only large city in it, and the principal trade is in live-stock and meat. If the country could secure a long spell of real peace, it would have an opportunity of developing its mineral resources, which at present are but little known, and are sadly hampered by want of communications. But there is no doubt that in Uruguay there are to be found gold, manganese, copper, iron, and lead, and also precious stones—*i.e.* rubies, diamonds, amethysts, and topazes. We have already referred to Mr. Koebel's excellent sketch of the tangled history of the country. We may add that in this volume he gives us a sprightly and graphic description of the scenery and the people with whom he came in contact during his sojourn there. Notwithstanding the terrible vicissitudes of its history, Mr. Koebel is sanguine of a happy and prosperous future for Uruguay, and he supports his opinion by commercial statistics and by his personal observations. We commend the work to the perusal of our readers. It is illustrated by numerous photographs and has a useful map.

AUSTRALASIA.

An Outpost in Papua. By Rev. A. Kent Chignell. London: Smith, Elder and Co., 1911. *Price* 10*s.* 6*d. net.*

If there is any person who still thinks, as was too commonly the case at one time, that a missionary book must be either dry-as-dust or goody-goody, we recommend him to peruse this most interesting volume. He will find how devotion, human sympathy, and success, may be combined with a keen sense of humour. A paragraph—which we have somewhat shortened—will serve for illustration. "It is holy ground, this ramshackle, ant-eaten Church of ours, even though the frogs come and hop about and sing to each other on the altar steps in the rainy season, and the little brown and green and golden lizards run up and down over the walls, and a big iguana lives in the roof, and the cats and fowls come in each day and scratch and hunt, and the land crabs dig holes and leave elaborate traceries over the smooth sand; and on Sundays the naked babies throw somersaults and laugh and crow and play king-of-the-castle in the midst of the sandy floor, and hide-and-seek round the open entrances and in and out of the vestries all through service-time; and I must shut my eyes and pray for Peter [the native preacher], and for the patient congregation, and for my impatient self, when the sermon is longer and more fantastic than usual; and flying things as big as mice come flopping into church in the evening, with the whir and fuss of aeroplanes, and claw me by the lip, and when I shake them off they go buzzing noisily straight for the big hanging kerosene lamp, and take headers down the chimney, and there is a loud pop, and a smell of baked meats, and the lamp flares up and smokes, and the glass cracks and falls in fragments, and we must finish the service by the light of a candle brought hastily from the altar."

As the Archbishop of Brisbane says in a prefatory note, "The freshness and humour, the varying moods, and the flavour of personal experience pervading the whole, make together a picture which grips the imagination."

The doings of the natives are delightfully told, and one would offer a tribute

to the high spirit and wide tolerance of the writer. The illustrations are good and well chosen.

POLAR.

Did Peary reach the Pole? By "An Englishman in the Street" (W. Henry Lewin). London: Simpkin, Marshall, Hamilton, Kent and Co., Ltd., 1911. *Price* 2*s.* 6*d.*

This little book answers the question raised in its title in the negative, the evidence offered being chiefly the great rapidity of Peary's final marches. Some of the figures worked out by the author are certainly striking, but we think that he does not perhaps allow sufficiently for the very perfect arrangements made by Commander Peary as the result of his long years of training in Polar work, and for the fact that he was concentrating all his energies upon speed in a much more systematic fashion than was done by the other explorers whose figures are given as a basis of comparison. These other explorers were in most cases doing a certain amount of scientific work, while Peary had but one object in view, to which all else was sacrificed. It will be recollected that the official committee which investigated Peary's records in America was not satisfied that he had actually reached the Pole, but decided that he had at least been very near to it. Most people will, we fancy, be content to leave the matter there, but those who are interested in controversies will find in this little book a vigorous and striking presentment of one side of the question.

GENERAL.

The Statesman's Year Book: Statistical and Historical Annual of the States of the World for the year 1911. Edited by J. Scott Keltie, LL.D. Forty-eighth Annual Publication. London: Macmillan and Co., 1911. *Price* 10*s.* 6*d. net.*

In his preface to this year's issue of this valuable annual Dr. Keltie alludes to the tragic death of Mr. J. P. A. Renwick, who had for twenty years been associated with him in the editorship. He has, however, obtained the assistance of Messrs. Epstein, Webb and Vigor, and by means of it the book has been revised and brought up to date, the sections relating to China, Spain, and Turkey being considerably improved. The maps as usual are excellent, and refer to such subjects of current interest as Railway Routes to India, the Panama Canal, and so forth.

Highroads of Geography (Royal School Series). First Book, *Price* 10*d.*; Second Book, *Price* 1*s.*; Third Book, *Price* 1*s.* 3*d.* London: Thos. Nelson and Sons, 1910-1911.

These nicely got-up books are illustrated by coloured reproductions from pictures, and are entitled respectively Sunshine and Shower, Scouting at Home, and South Britain. The first two give in simple language some account of common phenomena, such as rain and wind, the movements of the sun and so forth, with descriptions of the compass and the barometer, and accounts of simple methods of map-making and map-reading. The third part describes the geography of England. The books are pleasantly written, and convey a great deal of information in a manner likely to interest children, while the pictures will attract them greatly.

Travels in Sunny Lands. By the Rev. Donald Maclean, Minister of Free St. Columba Church, Edinburgh. Edinburgh: John Grant, 1911. *Price 3s. 6d. net.*

This is an account of a journey to Australia and back, the outward journey being made by South Africa and the return by the Suez Canal. A part of the book has already appeared in a Free Church magazine for young people, and the appeal is apparently chiefly to the young. The book has a coloured frontispiece and a considerable number of other illustrations. The ground covered by the journey is so familiar, and has been described so often, that it is perhaps impossible to find anything novel to say about the objects seen, and the author does not seem to us to have avoided the commonplace. The karoo struck him as monotonous, the people of Melbourne seemed much interested in horse-racing, Port Said is a "wicked city," Milan has a famous cathedral—such statements have to be set forth with much art before even the school child can find them very attractive. But to the unsophisticated the simple accounts of familiar things may prove interesting enough, and there are occasional gleams of unconscious humour, as when the author objects to the presence of "papists" in Santa Cruz.

Commercial Geography. By Edward Van Dyke Robinson, Professor of Economics in the University of Minnesota. Chicago and New York: Rand M'Nally and Co., n.d. *Price* $1.25.

There is no little advantage in having a Commercial Geography written by an economist. That is plain even from the remarks in the preface on pages vi-vii, where the author sets forth his idea of the nature and scope of commercial geography, an idea to which, it may be mentioned, no geographer can take exception, but it is still more clearly shown in the whole of chapter vi., entitled "How Commerce depends on Economic Forces," a remarkably concise and clear statement of the economic conditions which have always to be borne in mind in commercial geography. The book altogether is one of the best on the subject with which it deals, and is naturally most valuable with reference to the United States, to which 112 pages are devoted, besides 33 pages belonging to the two chapters on "American Expansion in the Pacific" and "American Expansion in the Caribbean." It is very fully illustrated both with maps, diagrams, and views. Those views, it should be added, are carefully selected so as to have real significance. Among the maps, one may call special attention to the outline railway map of the United States, between pages 196-197, in which two striking features may be noticed; first, the way in which the predominantly east and west direction of the railways to the north of the Missouri gives place, at least in the Mississippi valley, to a predominant north-south direction to the south of that river; and second, the remarkable gap in the railway system between the lower Missouri and the lower Arkansas, where the sparseness of the railway net-work is even more striking than in the Appalachian region. The work is generally accurate and well up to date. Blemishes of course it has, but for the most part trifling. Perhaps the most serious is an occasional tendency to daring generalisations, such as, for example, the statement on page 361 that "Europe is the true fatherland of civilisation," followed on the next page by a reference to paragraph 57, in which it is stated that since the dawn of history, some six thousand years ago, the white, yellow, and black races have been fixed types, and . . . it would therefore be a waste of time to discuss the business condition and prospects of such countries as Haiti or China." Neither history nor the evidence of those who know China best appears to support the disparaging implications of this reference.

The Abbé Huc was certainly not one too much biassed in favour of China, and yet he tells us "that when, in the sixteenth century, the Catholic missionaries arrived, bearing the message of the Gospel to the innumerable nations who form collectively the Chinese Empire, the spectacle that presented itself to their observations was calculated to strike them with astonishment, and even with admiration. Europe, which they had just quitted, was in the convulsions of intellectual and political anarchy. . . . China, on the contrary, stood in some measure at the zenith of her prosperity. . . . The imaginations of the missionaries could not but be powerfully affected by this immense empire, with its numerous and orderly population, its fields so skilfully cultivated, its great cities, its magnificent rivers, its fine system of canals, and its entire and prosperous civilisation. The comparison was certainly at that time not to the advantage of Europe." Mr. Robinson's contention appears in fact to smack too much of the not uncommon tendency to identify civilisation with whizzing wheels, dancing rods, and bursting shells.

Handbuch der Klimatologie. Von Dr. Julius Hann. Band III., Klimatographie. 2 Teil, Klima der Gemässigten Zonen u. der Polarzonen. Dritte, wesentlich umgearbeitete u. vermehrte Auflage. Stuttgart: J. Engelhorns Nachfolger, 1911. *Preis M.* 23.

We have noted here (cf. xxv. p. 276, and xxvi. p. 219) the successive appearance of the volumes of the third edition of Hann's great work. The present volume, devoted to temperate and polar regions, is of special interest, in that it utilises the material brought back by the recent Antarctic expeditions, and is thus enabled to give a much more detailed picture of the climate of the South Polar area than was previously possible. We are glad to note that Mr. R. C. Mossman's meteorological work is fully appreciated by Dr. Hann, who quotes from it extensively.

La Face de la Terre (Das Antlitz der Erde). Par Ed. Suess. Traduit avec l'autorisation de l'auteur et annoté sous les direction de Emmanuel de Margerie. Tome iii. (2e Partie). Paris: Librairie Armand Colin, 1911. *Prix 12 fr.*

This fasciculus of Prof. Suess's great work appears in its French dress with a great number of new figures, no less than ninety of these having been prepared especially for the French edition. Prof. de Margerie has also added a considerable number of new references and notes both in the text and at the foot of the pages, and has verified all Prof. Suess's original references. The additional references and figures are of great value, and because of them the French issue will doubtless be consulted by many British geographers, in spite of the fact that the book is now also available in an English translation.

NEW MAPS.

EUROPE.

ORDNANCE SURVEY OF SCOTLAND.—The following publications were issued from 1st to 30th June 1911:—

One-inch Map (third edition) engraved, in outline. Sheet 112. Price 1s. 6d.

Six-inch and Larger Scale Maps.—Six-inch Maps (Revised). Quarter Sheets, with Contours in Blue. Price 1s. each. *Ayrshire.*—10 SE.; 21 NE.; 29 SE.;

33 NW. With Contours in Black. Price 1s. each. *Ayrshire.*—38 NE. *Peeblesshire.*—19 SW. ; 25 SW.

1 : 2500 Scale Maps (Revised), with Houses stippled, and with Areas. Price 3s. each. *Lanarkshire.*—Sheets XXV. 16 ; XXXII. 1 ; XXXIII. 2, 3.

Note.—There are no coloured editions of these Sheets, and the unrevised impressions have been withdrawn from sale.

The following publications were issued from 1st to 31st July 1911 :—

One-inch Map (third edition), engraved, with hills in brown or black. Sheets 59, 89, 98, 106. Price 1s. 6d. each.

Six-inch and Larger Scale Maps.—Six-inch Maps (Revised). Quarter Sheets, with Contours in Blue. Price 1s. each. *Ayrshire.*—1 SE. ; (16 NW. and 16 SW.).

1 : 2500 Scale Maps (Revised), with Houses stippled and with Areas. Price 3s. each. *Lanarkshire.*—Sheets XXIV. 15 ; XXV. 12, 14, 15 ; XXXI. 4 ; XXXII. 2 ; XXXIII. 1. Sheets too open for publication on 1 : 2500 scale. *Lanarkshire.*—Sheets XXII. 11, 15.

Note.—There are no coloured editions of these Sheets, and the unrevised impressions have been withdrawn from sale.

GEOLOGICAL SURVEY OF SCOTLAND.—The following publications were issued from 1st to 30th June 1911 :—

Six-inch Maps. Quarter Sheets, uncoloured. Price 1s. 6d. each. *Lanarkshire.*—8 NE., 11 NW., 11 SW.

ADMIRALTY CHART, SCOTLAND.—Plans in the Hebrides. Vatersay Sound and Castle Bay ; Sound of Berneray ; Village Bay, St. Kilda. Published June 1911. Number 1144. Price 2s. *Admiralty Office, London.*

SCOTLAND.—W. and A. K. Johnston's "Three Miles to Inch" Map. Sheets 2, 3, 15, 16. Prices—dissected in cloth, in case, 2s. ; on cloth, in case, 1s. 6d. ; unmounted, in case, 1s. per sheet.

W. and A. K. Johnston, Limited, Edinburgh and London.

These sheets complete the new issue of Messrs. Johnston's Map of Scotland with orographical colouring.

SCOTLAND.—Bartholomew's Quarter-inch to Mile Map of Scotland. With orographical colouring and roads. Sheet 2.—*Inverness and Skye.* Sheet 3.—*Aberdeen and Grampians.* 1911. Price 1s. each sheet. Mounted on cloth, 2s. *John Bartholomew and Co., Edinburgh.*

The above are two more sheets of this new map of Scotland. They are distinguished by large and clear lettering with effective orographical colouring.

LONDON DISTRICT.—Bartholomew's Quarter-inch to Mile Map of Environs of London. Contour colouring. Showing all Roads for Motorists and Cyclists. 1911. Price 1s. 6d. paper ; 2s. 6d. mounted on cloth ; 3s. dissected.

John Bartholomew and Co., Edinburgh.

An entirely new map of the London District, embracing the country from Colchester on the east and all the south-east coast to Portsmouth and Winchester on the west.

UNITED STATES.—Topographic Sheets on scale of 1 : 31,680, or about 2 inches to a mile. 1910-11. Price 5 cents each sheet. The figures after the name of each State indicate the number of sheets received. California, 1.

Topographic Sheets on scale of 1 : 62,500, or about 1 mile to an inch. Indiana, 1 ; Minnesota, 2 ; New York, 2 ; Ohio, 3 ; Oklahoma, 1 ; Pennsylvania, 1 ; Tennessee, 1 ; Utah, 1 ; Washington, 3 ; West Virginia, 1 ; Wisconsin, 1.

Topographic Sheets on scale of 1 : 125,000, or about 2 miles to an inch. Colorado, 1 ; Georgia, 1 ; Texas, 1 ; Washington, 2.

Topographic Sheets on scale 1 : 9600. Colorado, 1.

Topographic Sheets on scale 1 : 12,000. New Mexico, 1.

United States Geological Survey, Washington, D.C.

AFRICA.

SOMALILAND.—Carte de la Côte Française des Somalis et Régions avoisinantes. Dressée par A. Meunier. Échelle 1 : 500,000. Feuille No. 2, Harrar ; Feuille No. 3, Addis-Ababa. 1909.

Service Géographique des Colonies, Paris.

WEST AFRICA.—Carte de l'Afrique Occidentale Française. Échelle 1 : 2,000,000. Feuille No. 2, Tombouctou. 1910.

Service Géographique des Colonies, Paris.

GENERAL.

OUTLINE MAPS.—The Visual Series of Improved Contour Outline Maps. Douglas and Philips' Patent. The British Isles. The Pennines. The Mediterranean Sea. Indian Empire. Central and South Africa. New Zealand. British North America. Price 6d. per packet of 25 of a kind ; single sheets, ½d. each. 1s. per packet of a kind, double sheets, 1d. each.

George Philip and Son, Limited, London.

These are simple clear outline maps with contour lines, but we fail to see where the "Patent" exists, either in the drawing of the outlines or the contour lines.

PLANISPHÈRE.—Bassin du Pacifique. Feuille 1 de l'Atlas Universel de Géographie ; commencé par M. Vivien de Saint-Martin et continué par F. R. Schrader. Price 2 francs. *Librairie Hachette et Cie, Paris.*

NEW ATLAS.

ATLAS OF PORTOLAN CHARTS.—Facsimile of Manuscript in British Museum. Edited by Edward Luther Stevenson, Ph.D. New York : The Hispanic Society of America, 1911.

The Hispanic Society of America has published and is publishing a considerable number of reproductions of interesting maps and charts, bearing upon the early discovery and exploration of America. The present Atlas is a reproduction of an atlas acquired by the British Museum in 1895, which is believed to be the oldest known Portolan Atlas on whose charts any part of the New World is laid down, and to be also the oldest known atlas in which the coast regions of a large part of the entire world are represented with fair accuracy. The edition is limited to one hundred and ten copies, and the atlas is beautifully got up, and reflects great credit upon the editor and the Hispanic Society. The charts will be found of great interest to students ; from internal evidence it is believed that their author was probably Vesconte de Maiollo, and their date the year 1508.

DENSITY OF POPULATION
OF
SCOTLAND
1911 CENSUS
ORKNEY
SHETLAND ISLANDS
ORKNEY ISLANDS
ATLANTIC
OCEAN
NORTH SEA
ENGLAND
IRELAND
ABERDEEN
PERTH
ARGYLL
INVERNESS
DUMFRIES

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

THE PURPOSE AND POSITION OF GEOGRAPHY.[1]

By Colonel C. F. Close, C.M.G., R.E.

I PROPOSE to devote the first part of this address to an examination of the purpose and position of Geography, with special reference to its relations with other subjects. It will not be possible entirely to avoid controversial matters: but, if some of the questions touched on are controversial, this only means that these questions have a certain importance. I shall try to describe the facts of the case impartially.[2]

In the second part I shall try to indicate briefly what the Government, as represented by the great Departments of State, is doing for Geography.

PART I.—*The Position of Geography with reference to other Subjects.*

It is no secret that the geographical world is not unanimous about the meaning and object of Geography. The definitions suggested by such writers as Mr. Chisholm, Professor Davis, Professor Herbertson, Mr. Mackinder, or Dr. Mill, are not in agreement. From time to time an attempt is made to formulate some statement which shall not commit the subscribers to anything very definite. But differences of opinion on the subject persist.

There are, of course, a great many ways of approaching the question. Let us, for example, examine the proceedings of such representative bodies as the British Association and the Royal Geographical Society, and of such assemblies as the International Geographical Congresses, and let us see if we can find out what is, as a fact, the scope of the subject as dealt with by these bodies. They are institutions which

[1] The Presidential Address delivered to Section E (Geography) at the Portsmouth Meeting of the British Association.

[2] *Cf.* p. 517.

work in the full light of day, and they are too large to be dominated for any length of time by individuals. If we can find any working principle, any common term, amongst these societies, we shall have gone some way towards arriving at a solution of the problem.

A simple method of investigation is to discuss the character of the publications of these societies and of the lectures delivered before them. And I feel that I cannot do better than devote most of this brief analysis to the Royal Geographical Society and its admirably edited *Journal*. Here we are on safe ground. If an inhabitant of another planet wished to know what we understand by astronomy, we could confidently refer him to the Monthly Notices of the Royal Astronomical Society. If he were curious about the condition of geology, we should give him the volumes of the Geological Society. And, if he were so rash as to ask what are the objects of the modern mathematician, we should hand him the papers published by the London Mathematical Society. The *Geographical Journal* occupies no lower a position with reference to Geography than do the other journals mentioned with reference to the sciences with which they deal.

In analysing the contributions to the Royal Geographical Society, it is important to start with an honest classification. In the endeavour to be impartial I have chosen the classification which was adopted for the last International Geographical Congress, *i.e.*, that held at Geneva in 1908. This Congress was divided into fourteen sections. It will serve to clear the ground if we deal first with Sections 12, 13, and 14; these are the Teaching of Geography, Historical Geography (which was mainly concerned with the history of travel and exploration), and Rules and Nomenclature. For the purpose of discovering what Geography is, these three sections will not be of any assistance. Every subject has its educational side, its history, and its rules and nomenclature. The subject proper was, therefore, divided into eleven sections. The eleven sections are the following:—

1. Mathematical and Cartographical Geography.
2. General Physical Geography.
3. Vulcanology and Seismology.
4. Glaciers.
5. Hydrography (Potamography and Limnology).
6. Oceanography.
7. Meteorology and Climatology; Terrestrial Magnetism.
8. Biological Geography.
9. Anthropology and Ethnography.
10. Economic and Social Geography.
11. Explorations.

Before applying this classification to the work of the Geographical Society, I wish to call attention to the extremely frank way in which vulcanology, seismology, meteorology, climatology, terrestrial magnetism, anthropology, and ethnography, are included in Geography. The list in fact covers ground occupied by several sections of the British Association.

I have investigated the work of the Geographical Society for the five complete years 1906 to 1910. The orginal contributions to the *Geographical Journal* have been examined for that period, omitting from consideration contributions on the subjects of teaching, the history of exploration, and rules and nomenclature.

There are altogether 296 original papers which come under one or another of the eleven headings given above. Of these papers 171, or 57 per cent., deal with Explorations and Travels. There is a great drop to the next largest section, General Physical Geography, which accounts for thirty papers, or about 10 per cent. Adhering to the order of the Geneva Congress the complete list is as follows :—

Original Contributions to the Proceedings of the Royal Geographical Society during the five years 1906 *to* 1910.

Subject.	Percentage.
1. Mathematical and Cartographical Geography,	3
2. General Physical Geography,	10
3. Vulcanology and Seismology,	5
4. Glaciers,	3
5. Hydrography (Potamography and Limnology),	5
6. Oceanography,	3
7. Meteorology and Climatology; Terrestrial Magnetism,	3
8. Biological Geography,	1
9. Anthropology and Ethnography,	3
10. Economic and Social Geography,	7
11. Explorations,	57

The main conclusion is obvious enough. For the principal Geographical Society in the world, geography is still mainly an affair of explorations and surveys; if to this item we add cartography, we account for 60 per cent. of the activities of the Society.

There is another important deduction which is natural and unforced: the papers on vulcanology and seismology and on glaciers could have been read with perfect appropriateness before the Geological Society; those on meteorology and climatology before the Meteorological Society; and those on anthropology and ethnography before the Anthropological Society. To make quite sure of this point I will cite a few titles of the papers read: "The great Tarawera Volcanic Rift," by J. M. Bell; "Recent Earthquakes," by R. D. Oldham; "Glacial History of Western Europe," by Professor T. G. Bonney; "Climatic Features of the Pleistocene Ice-Age," by Professor A. Penck; "Rainfall of British East Africa," by G. B. Williams; "Geographical Distribution of Rainfall in the British Isles," by Dr. H. R. Mill; "Geographical Conditions affecting Population in the East Mediterranean Lands," by D. G. Hogarth; "Tribes of North-Western Se-Chuan," by W. N. Fergusson.

This little list of typical subjects indicates clearly that there is a large group of contributions which would have found an appropriate

home in the journals of the Geological, Meteorological, and Anthropological Societies: there is a possible corollary that, since men who make a life study of these subjects are best capable of dealing with them, the authors of the above type of paper who submit their work to the Geographical Society, in so doing appeal rather to the public at large than to men of their own special sciences.

We may therefore sum up the results of this brief investigation into the work of the Royal Geographical Society by saying that 60 per cent. of it is concerned with exploration and mapping, and that some of the remainder could be dealt with appropriately by the learned societies concerned, but that the Geographical Society serves as a popularising medium. It also serves a useful purpose as a common meeting-ground for vulcanologists, seismologists, oceanographers, meteorologists, climatologists, anthropologists, and ethnographers.

Another line of investigation may be profitably pursued. Who are, by common consent, the leading geographers of the world? No doubt the explorers come first in popular estimation, such men (omitting British names) as Peary, Charcot, Sven Hedin. Then after this type would come the men of learning who stand out in any International Congress. These men stand out because they have, by their own exertions, increased the sum of human knowledge. Omitting for the moment the consideration of exploration and mapping, we find that in an International Congress a large number of the most celebrated geographers are eminent as geologists. In such a gathering we can also pick out those who have advanced the sciences of meteorology or anthropology.

Now, let us suppose the position reversed. Let the functions of geology be supposed to be somewhat in dispute and those of geography perfectly definite, and further let us suppose that at an international meeting of geologists a large proportion of the men of real distinction were geographers. We may in this way get an idea of what geography looks like from the outside.

I think that at this point we may explain, in a preliminary way, the work of the Geographical Societies, after the fashion of the *Child's Guide to Knowledge*:—

> *Question.*—What is Geography?
>
> *Answer.*—There is no generally accepted definition of Geography.
>
> *Question.*—Can we not form some idea of the scope of the subject by considering the work of the Royal Geographical Society?
>
> *Answer.*—Yes; 60 per cent. of this work deals with explorations, surveys, and mapping, and of the rest a considerable portion consists of matter which could be discussed appropriately before the Geological, Meteorological, and Anthropological Societies.
>
> *Question.*—What, then, leaving maps out of consideration, are the useful functions of a Geographical society?
>
> *Answer.*—A Geographical society serves to popularise the work

of men who labour in certain fields of science, and such a society forms a very convenient meeting-ground for them.

Question.—What is a geographer?

Answer.—The term geographer is sometimes applied to explorers; sometimes to men who compile books derived mainly from the labours of surveyors, geodesists, geologists, climatologists, ethnographers, and others; sometimes to those who compile distributional maps.

Question.—Can a geographer who has not made a special study of one or more of such subjects as geodesy, surveying, cartography, geology, climatology, or ethnography, hope to advance human knowledge?

Answer.—He can do much to popularise these subjects, but he cannot hope to do original work.

Another way of attempting to ascertain the meaning and object of Geography is to study the character of the instruction given in the universities, and we may suppose that this can be fairly judged by the contents of standard text-books. Let us take, for example, the *Traité de Géographie Physique* of M. E. de Martonne, formerly Professor of Geography at the University of Lyons, now Professor at the Sorbonne. The work in question was published in 1909, and is divided into four main sections—Climate, Hydrography, Terrestrial Relief, and Biogeography.

The first sentence of the book is "What is Geography?" Twenty-four pages are devoted to discussing this question, which the writer, with all his skill and learning, finds it difficult to answer definitely and convincingly. One receives the impression of the dexterous handling of a difficult question, and of a generally defensive attitude. In this book geography is said to depend on three principles. The principle of *extension*, the principle of *co-ordination*, and the principle of *causality*. As an illustration of the meaning of the principle of extension, we are told that "the botanist who studies the organs of a plant, its conditions of life, its position in classification, is not doing geographical work; but if he seeks to determine its area of extension, *il fait de la géographie botanique*. I believe that we have here reached a critical point. The claim is, that when, in the prosecution of a botanical study, a map is used to show the distribution of a plant, the use of such a map converts the study into a branch of geography. Well, it is a question of definition and convention, which cannot, I imagine, be settled except by the general agreement of all the sciences. We have to make up our minds whether a man who constructs a distributional map is doing "geography." One thing, I suppose, is not doubtful. When the map is made it will be better interpreted by a botanist than by a person ignorant of botany. In the same way the discussion of an ordinary geological map is best undertaken by a geologist, and so on. It would appear that geography, in the sense mentioned, is not so much a subject as a method of research.

It will be convenient here to say a few words about the relations between Societies and Schools of Geography and those two important

subjects, geodesy and geology. Curiously enough, there is not, and has never been, in the United Kingdom a society or body specially charged with the study of geodesy. Geodesy, in fact, has no regular home in these islands. But the Royal Geographical Society has done a good deal in the past few years to stimulate an interest in the subject, thereby fulfilling what I believe to be one of the Society's most useful functions, that of popularisation.

If, however, an authoritative opinion were required on any geodetic question, where could it be obtained? Well, I suppose there is no doubt that the headquarters of this branch of learning is the International Geodetic Association, but the scientific work itself is being largely carried out at the Geodetic Institute at Potsdam, by the Survey of India, by the Geodetic Section of the Service Géographique, by the U.S. Coast and Geodetic Survey, and by similar bodies. Geodesy, especially in its later developments, is a definitely scientific subject which demands much study and application. It is but slightly touched upon by the Schools of Geography. Perhaps I may here point out that geodesy is by no means mainly concerned with the shape of the spheroid. The chief problems are now those of isostasy and local attraction generally, the real shape of the sea-surface, the continuity of the crust of the earth and changes of density therein.

The position in which geography finds itself with regard to geology can be clearly seen if reference is made to the new edition of the *Encyclopædia Britannica*. In the eleventh volume of this work are two important articles, "Geography," by Dr. H. R. Mill, and "Geology," by Sir Archibald Geikie. In the article on "Geography" we find a description of geomorphology as that part of geography which deals with terrestrial relief, and a remark is made that "opinion still differs as to the extent to which the geographer's work should overlap that of the geologist." In this article, however, most of the authorities quoted are geologists, and the author remarks that "the geographers who have hitherto given most attention to the forms of the land have been trained as geologists."

Turning to the article on "Geology" we find an important section on "Physiographical Geology," which is described as dealing with the investigation of "the origin and history of the present topographical features of the land." Now this is the exact field claimed for geomorphology. It has been observed by others, notably by Professor de Martonne, that the interpretation of topographic forms has been most successfully undertaken by geologists, and he gives as an instance of this the good work done by the United States Geological Survey.

I do not know whether any geographer untrained as a geologist has contributed anything of value to geomorphology.

Another test which may be applied is the following:—Let us imagine geography to be non-existent and note what the effect would be. Suppose there were no such things as Government Geographical Services, or Schools of Geography at the Universities, or Geographical Societies. The first and most obvious result would be that most, if not all, of our apparatus of exploration and mapping would have disappeared. But as

we are all in agreement as to the necessity of this branch of human effort, let us restore this to existence and examine the effect of the disappearance of the rest.

So far as concerns geodesy, we should still possess the International Geodetic Association, the Geodetic Institute at Potsdam, and the United States Geodetic Survey, and similar bodies. But we should have lost the means of popularising geodesy in the proceedings of Geographical Societies: and, as there would be now no geographical text-books, elementary geodesy would not find itself between the same covers as climatology and geomorphology.

As regards geomorphology, or physiographical geology, not very much difference would be noted. The geologists would still pursue this important subject; but here again their writings would perhaps appeal to a more expert and less popular audience, although it is not to be forgotten that many admirable introductions to the subject have been written by geologists.

Much the same might be said about meteorology and climatology. There would be text-books devoted to these studies, but there might be a diminution of popular interest.

Such names as phyto-geography would disappear, but the study of the botany (if we permit it the use of distributional maps) would not be affected. The loss to knowledge would be mainly that of getting to a certain extent out of touch with the public. The constitutions of the various learned bodies would remain the same and so would their functions. The constitution of the Royal Society, which has never recognised geography as a subject, would be totally unaffected.

If we thus study the relations between geography and other subjects we are almost bound to arrive at the conclusion that geography is not a unit of science in the sense in which geology, astronomy, or chemistry are units. If we inquire into the current teaching of geography, and examine modern text-books, we find that most of the matter is derived directly from the workers in other fields of study. And if we inquire into the products of Geographical societies, it becomes evident that one of the most important functions fulfilled by these useful bodies is to popularise the work of geodesists, geologists, climatologists, and others, and to provide a common meeting-ground for them. If geography had been able to include geology and the other sciences which deal with earth-knowledge, it would then, indeed, have been a master science. But things have worked out differently.

I shall very probably be told that, in laying some stress on the above-mentioned aspects of the subject, I have forgotten that the main purpose of geography is the study of the earth as the home of man, or the study of man as affected by his environment, and that, however necessary it may be to begin with a foundation of geodesy, geology, and climatology, we must have as our main structure the investigation of the effect of place conditions on the races of man, on human history and human industry, on economics and politics.

It is obviously and abundantly true that no student of history, economics, or politics can disregard the effect of geographical environ-

ment. But it is not, as a fact, disregarded by writers on these subjects. The question is, to a large extent, whether we should annex these portions of their studies, group them and label them "Geography." Our right to do this will depend on the value of our own original investigations. We have the right to use the results obtained by others, provided that we add something valuable of our own.

Before this human aspect of geography—or, for that matter, any other aspect of the subject—is recognised by the world of science as an independent, indispensable, and definite branch of knowledge, it must prove its independence and value by original, definite, and, if possible, quantitative research.

Part. II.—*Geography and the Government Departments.*

Whatever definition of geography is accepted we are all in agreement that the map is the essential foundation of the subject. I propose now to indicate very briefly how the British Government, as represented by the great Departments of State, is, in this respect, assisting the cause of geography. The departments which are interested in maps and surveys are the following:—The Admiralty, the War Office, the Colonial Office, the India Office, the Board of Agriculture, and the Foreign Office.

The immense services rendered, not only to this country, but to the whole world, by the Hydrographic Department of the Admiralty, are known to all. But it would be somewhat rash for a soldier to talk about hydrographic surveys, so I will confine my remarks to surveys on land.

First, it should be remarked that the British Government as a whole has for many years shown its interest in geography, and has recognised the good work done by the Royal Geographical Society by contributing a sum of £500 towards the funds of the Society. Next, it should be noted that from time to time British Governments have contributed large sums of money towards Arctic and Antarctic exploration. The most recent examples of this very practical form of encouragement will be remembered by all: I mean the Government expenditure on Scott's first Antarctic Expedition and the handsome sum contributed towards the cost of Shackleton's great journey.

Turning now to the War Office, the first matter to which I would call attention is that nearly all the accurate topographical surveys of the empire have been started by soldiers. This applies to the United Kingdom, Canada, Australia, South Africa, Tropical Africa, and last, but greatest of all, India. The accounts of the struggles of soldiers at the end of the eighteenth century to obtain sanction for what is now known as the Ordnance Survey form very interesting reading. In fact, all over the world it was military requirements which produced the topographical map: and it is still the war offices of the world which control the execution of almost all geographically important surveys. During the last few years the largest block of work undertaken by the War Office has been the accurate survey of the Orange Free State, which has an area of about 52,000 square miles—nearly the size of England—and an adjacent reconnaissance survey in the Cape of Good Hope covering an area of a

hundred thousand square miles. There has been some inevitable delay (due to causes which need not be gone into now) in the publication of the sheets of this survey, but the work is being pushed on. The survey of the Orange Free State is fully comparable with the admirable surveys carried out by the French Service Géographique de l'Armée in Algeria and Tunis. Some work has also been done in the Transvaal. Other surveys carried out in recent years under the direct control of the War Office are those of Mauritius, St. Helena, a portion of Sierra Leone, Malta, and Hong Kong. The most notable work which is now being carried out in the Self-Governing Dominions is the Militia Department Survey of Canada, with which excellent progress has been made.

The total area of the Crown Colonies and Protectorates, under the rule of the Colonial Office, amounts to about two million square miles. British African Protectorates form a large portion of this total, and I will indicate briefly what is being done to survey these tropical Protectorates. From the geographical point of view the brightest regions are East Africa, Uganda, and Southern Nigeria. In East Africa topographical surveys of the highlands and coast belt are being pushed on by military parties as part of the local survey department. The area of exact work done amounts now to some 30,000 square miles. In Uganda a military party has recently completed a large block of country, and in this Protectorate thoroughly reliable maps of 32,000 square miles are now available. In Southern Nigeria a completely reorganised survey department is tackling in a thoroughly systematic fashion the difficult task of mapping a forest-clad country. We shall shortly see the results.

For the information of those who have not travelled in Tropical Africa it should be remarked that surveying in such countries is attended by every sort of difficulty and discomfort, and too often by illness and serious discouragement. It is one thing to sit at home in a comfortable office and plan a scheme of survey, and quite another thing to carry it out on the spot. We do not, I am convinced, give enough honour and credit to those who actually get the work done in such trying circumstances. Honest accurate survey work in the tropics puts a much greater strain on a man than exploratory sketching. To picture what the conditions are, imagine that you are to make a half-inch survey of the South of England; cover the whole country with dense forest; put mangrove swamps up all the estuaries; raise the temperature to that of a hot-house; introduce all manner of insects; fill the country with malaria, yellow fever, blackwater fever, and sleeping sickness; let some of your staff be sick; then have a fight with the local treasury as to some necessary payment, and be as cheerful as you can. That is one side of the medal. On the other side there is the abiding interest which the surveyor feels in the country, the natives, and the work; the sense of duty done; and the satisfaction of opening up and mapping for the first time a portion of this world's surface.

There is no time to mention other surveys in Africa, and I will pass on to a very interesting part of the world, the Federated Malay States. In this prosperous country much excellent geographical work is being

done by the combined survey department which was established under a Surveyor-General in the year 1907. The department is in good hands, and the commencement of a regular topographical series is being undertaken.

I wish it were possible to prophesy smooth things about Ceylon. From our special point of view the situation leaves much to be desired. There is not yet published a single topographical map, and the topographical surveys are progressing at a rate which, under favourable conditions, may result in the maps being completed in the year 1970.

In closing this inadequate review of the principal surveys which are being undertaken in the Crown Colonies and Protectorates, I should mention that the co-ordinating factor is the Colonial Survey Committee, which every year publishes a report which is presented to Parliament.

The *India Office* is of course concerned with that great department, the Survey of India. The Indian Empire has an area of about 1,800,000 square miles, and as, under the arrangements approved in 1908, the standard scale of survey is to be one inch to one mile, the area of paper to be covered will be 1,800,000 square inches. Actually this is divided into about 6700 sheets. The Survey of India has always been famous for its geodetic work and for its frontier surveys and methods. Its weak point used to be its map reproduction. This has been greatly improved. But personally I feel that if, for most military and popular purposes, a half-inch map is found suitable for England, as is undoubtedly the case, there is no reason why a half-inch map should not also be suitable for India. It is mainly a question of putting more information on the published map, and of engraving it and using finer means of reproduction. If this smaller scale were adopted all the information now presented could be shown, and the number of the sheets would be reduced from 6700 to 1675, a saving of 5000 sheets. It is difficult to avoid the feeling that the Survey of India is overweighted with the present scheme. The scheme has, however, many merits. It will be impossible to carry it out unless the department is kept at full strength.

The *Board of Agriculture* is the department which is charged with the administration of the Ordnance Survey. The Ordnance Survey spends some £200,000 a year, and for that sum it furnishes the inhabitants of the United Kingdom with what are, without doubt, the finest and most complete series of large-scale maps which any country possesses. There is nothing in any important country (such as France, Germany, Italy, Russia, or the United States) to compare with our complete and uniform series of sheets on the scale of $\frac{1}{2500}$. These sheets are sold at a nominal price, and are in effect a free gift to landowners, agents, and all who deal with real property. They are also, of course, invaluable to county and borough engineers and surveyors. They really are a national asset which is not half enough appreciated. The whole conception of these large-scale plans has stood the test of time, and is greatly to the honour of a former generation of officers.

Much might be said about the small-scale maps of the Ordnance Survey, which are now published in a very convenient form. As mentioned below, the latest small-scale Ordnance Map is the new Inter-

national Map on the million scale. Some sheets of this map will shortly be published.

The *Foreign Office* is concerned with the surveys of the Anglo-Egyptian Sudan, which are at present mainly of an explanatory character. The taking over of the Province of Lado has recently thrown fresh work on the Sudan Survey Department. The Foreign Office, which administers Zanzibar, has recently given orders for the survey of the Island of Pemba, a dependency of Zanzibar, and this is being carried out by a small military party.

But the greatest service to geography rendered by the Foreign Office in recent years was the encouragement given to the project of the International Map by the assembly of an International Committee in November 1909. Sir Charles, now Lord Hardinge, presided at the opening session. There were delegates from Austria-Hungary, France, Germany, Great Britain, Canada, and Australia, Italy, Russia, Spain, and the United States, and, as is known, the resolutions which were devised by the Committee were agreed to unanimously. After the conclusion of the work of the Committee the Government communicated the resolutions to all countries which had not been represented, and nearly all the replies which have been received are favourable. Maps in exact accordance with the resolutions are, it is understood, being produced by France, Hungary, Italy, Spain, the United States, and other countries, and so far as we are concerned, by the General Staff, the Ordnance Survey, and India. These maps will be shown at the International Geographical Congress which meets at Rome in October next.

I have now come to the end of this rapid sketch of the geographical work of the official world. It is work which, though often of an apparently humdrum character, outweighs in importance the sum total of all which can by an possibility be undertaken by private agency or by societies. But it is the very legitimate business of societies to criticise and encourage.

It is, in fact, not only our manifest duty to encourage the systematic mapping of the world on which we live, but we should do all we can to ensure the perfection, and suitability for their special purposes, of the maps themselves. In the surveying of the earth's surface and its representation by means of maps, we are treating of matters which are essentially and peculiarly our own.

It would appear that another great function of geography, as represented by Geographical Societies and Congresses, is to serve as a popularising medium for such sciences as geodesy, geology, climatology, and anthropology, and also to serve as the means of bringing together the workers in these sciences. We may be told that so far as this Association is concerned, the exact study of geodesy and meteorology is dealt with by Section A, geology by Section C, and anthropology by Section H, but there is, I believe, no other section which forms a more convenient general meeting-ground for all the workers in the various divisions of earth-knowledge. We ourselves have our own special work, work which is shared by no others, the great task of mapping the

world. This task is such a necesssary one, and it is of such genuine value to so many studies, that by assisting in it we are really furthering the Advancement of Science, which is the object of this great Association.

THE MEETING OF THE BRITISH ASSOCIATION.

THE Portsmouth meeting of the British Association was opened on Wednesday, August 30, when the inaugural address was delivered by Prof. Sir William Ramsay before a large audience in the Town Hall.

His address was upon "Sources of Energy," and we quote a few passages which have a definitely geographical bearing:—

"I suppose that it will be generally granted that the Commonwealth of Athens attained a high-water mark in literature and thought which has never yet been surpassed. The reason is not difficult to find: a large proportion of its people had ample leisure, due to ample means: they had time to think, and time to discuss what they thought. How was this achieved? The answer is simple: each Greek freeman had on an average at least five helots who did his bidding, who worked his mines, looked after his farm, and, in short, saved him from manual labour. Now, we in Britain are much better off: the population of the British Isles is in round numbers forty-five millions; there are consumed in our factories at least fifty million tons of coal annually, and "it is generally agreed that the consumption of coal per indicated horse-power per hour is on an average about 5 lb." (Royal Commission on Coal Supplies, Part I.) This gives seven million horse-power per year. How many man-power are equal to a horse-power? I have arrived at an estimate thus: a Bhutanese can carry 230 lb. plus his own weight, in all 400 lb., up a hill 4000 feet high in eight hours: this is equivalent to about one-twenty-fifth of a horse-power; seven million horse-power are therefore about one hundred and seventy-five million man-power. Taking a family as consisting on the average of five persons, our forty-five millions would represent nine million families: and dividing the total man-power by the number of families, we must conclude that each British family has, on the average, nearly twenty "helots" doing his bidding, instead of the five of the Athenian family. We do not appear, however, to have gained more leisure thereby, but it is this that makes it possible for the British Isles to support the population which it does.

"We have in this world of ours only a limited supply of stored-up energy: in the British Isles a very limited one—namely, our coalfields. The rate at which this supply is being exhausted has been increasing very steadily for the last forty years, as any one can prove by mapping the data given on page 27, Table D, of the General Report of the Royal Commission on Coal Supplies (1906). In 1870 one hundred and ten million tons were mined in Great Britain, and ever since the amount has increased by three and a third million tons a year. The available

quantity of coal in the proved coalfields is very nearly one hundred thousand million tons; it is easy to calculate that if the rate of working increases as it is doing our coal will be completely exhausted in one hundred and seventy-five years. . . .

"This consumption is still proceeding at an accelerated rate. Between 1905 and 1907 the amount of coal raised in the United Kingdom increased from two hundred and thirty-six to two hundred and sixty-eight million tons, equal to six tons per head of the population, against three and a half tons in Belgium, two and a half tons in Germany, and one ton in France. Our commercial supremacy and our power of competing with other European nations are obviously governed, so far as we can see, by the relative price of coal; and when our prices rise, owing to the approaching exhaustion of our supplies, we may look forward to the near approach of famine and misery."

Sir William Ramsay went on to discuss various possible new sources of energy, and came to the conclusion that none of these are likely to be important, and that it is very necessary therefore to economise so far as possible the energy stored up in our coal beds.

The proceedings in Section E were opened on Thursday morning by the delivery of Col. Close's address, which we publish in the present issue. The opinions set forth in the first part of this address did not meet with entire acceptance by the geographers present, and we hope to print here later a statement of another point of view.

After the delivery of this address Prof. A. J. Herbertson read a paper on "Thermal Maps," in which he said that the ordinary maps of the meteorologists were not of much practical use to the geographer, who wanted a map showing the actual temperature at the bottom of the atmosphere and not that over an ideal surface. He discussed the various difficulties in the way of the preparation of such maps, and showed mean actual temperatures for January and July at the bottom of the atmosphere. From these, with certain corrections for the inter-tropical regions, he had prepared a map, with the assistance of some pupils, showing the natural thermal divisions of the earth's surface. As showing the value of such a map, he pointed out that it removed the popular misconception that the heating of Tibet caused the monsoons of India. The map was of great theoretical and practical value in giving the geographer precise data for a study of the thermal quality of the atmosphere in different parts of the world, and in giving to colonists and others an accurate picture of the mean thermal conditions at the opposite seasons of the year in the countries in which they were interested.

Mr. A. R. Hinks then spoke on the "Representation of Hill Features," and offered some suggestions for a revised method of using colour in order to bring out the relief of the country on topographical maps. He said that the excellent maps on the "layer" system of the Ordnance Survey were a great advance upon previous productions, but the layer system was very inelastic and could not be modified to suit a particular sheet. He suggested that, by putting a shaded band of colour along each contour line, the advantages of the layer system in showing the

general relief of the country might be obtained, and at the same time many of the disadvantages in obscuring the detail of the map avoided.

Two papers were then communicated by Captain E. O. Henrici, R.E. The first was on "Mean Sea-level," and in it the author said that in the Report of the Royal Commission on Coast Erosion it is stated that there is some evidence that the land on the coasts of Northumberland and Durham is sinking relatively to the sea. The only method of determining whether this is so or not is by means of accurate observations of mean sea-level with reference to marks on shore. The sea-level is, however, constantly altering, not only with the tides, but also with the winds, height of barometer, and rainfall. Accordingly, in order to determine what is mean sea-level it is necessary to take observations over a long period of years. Observations at some two dozen stations round the coasts of Great Britain were taken by the Ordnance Survey in 1859, but they were carried out over much too short a period to enable any conclusions to be drawn as to earth movements. There exist some fifteen recording tide-gauges round the coasts of Great Britain, but as they are installed to obtain tidal records for navigation purposes no great degree of accuracy is required, and it is probable that the work of reducing their records to mean sea-level would not be justified by results.

The determination of the relative value of the height of mean sea-level as determined by levelling between the different gauges was carried out in 1860, but it is possible that there may be an error of a foot in the determination of the height of the zero of a tide-gauge as compared with Ordnance datum, and there may also be an error of a foot in the determinations made by the Ordnance Survey of the height of mean sea-level as compared with the zero of the tide-gauge. The values of the height of mean sea-level above Ordnance datum varied from 0 to nearly 2 feet, with an average of ·65 feet above. These variations are about what is to be expected from errors of observation, and do not afford any evidence that mean sea-level is not constant round our coasts.

The second paper dealt with the "Height of Ruwenzori," a subject of considerable interest in view of the fact that very varied figures have been given. The data upon which the given computation has been based were obtained by Captain Jack in the course of observations made during geodetic work in Africa, and these data were left by Captain Jack in the hands of Captain Henrici, when the former had to leave England. The initial mark, with reference to which the heights were determined, was the station peg at Lake Albert Station. The position of the highest point of the mountain was determined as 0° 23′ 10·690″ N. Lat., and 29° 52′ 15″ E. long. The calculations give the height of this point as 16,801·3 feet, with a probable error of ±5·3 feet.

In a paper published in the Royal Geographical Society's *Journal* for March 1907 the following figures were given: Position, 0° 23′ 0″ N. lat., 29° 52′ 20″ E. long.: height from the best trigonometrical data at the time, 16,619 feet: height as determined barometrically by the Duke of Abruzzi, 16,814 feet.

This trigonometrical height was arrived at from observations taken under rather unfavourable circumstances from the south, the length of the rays being 100 miles and over.

On Friday morning Section E held a joint meeting with Section C (Geology), the first paper being one by Mr. Clement Reid, F.R.S., on the "Former Connexion of the Isle of Wight with the Mainland." Mr. Reid said that all visitors to Portsmouth must be struck by the great beauty of the winding channel separating the Isle of Wight from the mainland. The origin of the channel had led to much speculation, and to the geographer and geologist the neighbourhood of Portsmouth was one of the most interesting districts in these islands.

At the present day there was no need to discuss the hypothesis that valleys like the winding channel which cut off the island from the mainland were due to some convulsion of nature which had formed a wide rift. Somewhat later, channels like the Solent were referred to the eroding action of the sea and tides, but that hypothesis also broke down as soon as a careful examination was made of the shores of the Solent, of its tides and of their scour. The sea was neither cutting nor widening the Solent, and except in the parts where the waves of the open sea could reach there was a great tendency towards silting up and the formation of wide tracts of salt marsh or shingle. The third hypothesis, which was commonly accepted in these days, was that the Solent was a submerged river-valley which had been cut into laterally by the sea and thus isolated. But opinions differed as to the direction in which the river flowed. He maintained that the ancient river Solent indubitably flowed from the west; not only so, but that at one time it was one of the largest rivers in England, comparable in drainage and in its relation to geological structure to the Thames. On either side of the Solent or Spithead, sheets and terraces of sub-angular river gravel sloped up and up to a height of at least 400 ft. above the sea, though in the centre of the river valley they passed actually beneath the present sea-level. Those gravels had a very peculiar composition, and by tracing the stones towards their source it was possible to arrive at some very surprising conclusions as to the direction of the flow of the ancient Solent.

He proceeded to follow the extinct river from its mouth to its source, or rather sources, for it was a river of many heads, draining an extensive area. When first earth-movements formed the tertiary basins of Hampshire and London, each of the basins, which were very similar, was occupied by an eastward flowing river. The valley of the Thames seemed merely to have deepened, retaining all along approximately its original course. The valley of the Solent, on the other hand, ran for some distance parallel to the sea and at no great distance from it. The result was that the sea finally broke through the narrow ridge of chalk which once ran continuously from the Needles to the Dorset coast, thus diverting the Frome and all the western rivers from their natural course to the Solent, and isolating the Isle of Wight. That flank attack had still other effects, for the Lower Avon was then only a short river. Instead of having a gentle fall of many miles and reaching the sea somewhere near Portsmouth, it reached the sea by a short, steep, direct course.

Consequently, as it flowed over soft tertiary strata, it lowered its bed so rapidly as to cut back the valley and capture the whole of the drainage of Salisbury Plain, which before that continued its natural course south-eastward and flowed into Southampton Water. Thus the great river Solent had all its head-waters cut off, and was divided into several separate river basins, each with its own outlet. That happened, he thought, in late Pliocene times. Those flank attacks were still going on further west, and if they continued much longer the breach at Lulworth Cove might widen and deepen in the same way, so that with slight submergence the so-called Isle of Purbeck might become a true island exactly comparable in its geological structure with the Isle of Wight.

Though at that early date the Isle of Wight was cut off from the mainland, it was probably at first only separated by a small stream and marshes, and was sometimes an island, sometimes part of the mainland, as the sea-level varied. The final isolation took place at quite a recent period, for if Professor Ridgway and he were right the Isle of Wight was the Ictis and Vectis of classical writers. The island of Ictis was described as being cut off at high tide, but connected at low tide by a narrow stone causeway. That causeway, he believed, was the ledge of Bembridge limestone which swept across what was now the Solent from Yarmouth to Hurst Castle, and was intact two thousand years ago. It had now been destroyed by the attacks of the sea, and was apparently impassible even during the Roman occupation, for their roads seemed to have led to a ferry further east and west of the run of the sea. Thus geology and history joined hands, and geology helped to an understanding of the origin of one of the most important harbours of the world. The Solent, Spithead, and Southampton Water were parts of an ancient submerged valley system, the preservation of which from complete silting up was largely due to the diversion of the mud brought down by many of the rivers, so that it no longer reached them.

This paper was followed by one by Professor J. W. Gregory on "Constructive Waterfalls," which we publish in this issue (p. 537).

Professor O. Pettersson then gave a very interesting address on "Tidal Movements in the Deep Water of the Skagerrak and their Influence upon the Herring Fishery," in which he said that "the most prominent feature in the hydrographic state of the eastern side of the North Sea, and its tributaries, the Baltic, the Kattegat, the Skagerrak, and the Scandinavian fiords, is the stratification of the waters in layers of different origin discernible by difference in their temperature and salinity. The boundary surface between two adjacent water layers can, as a rule, be located with considerable accuracy, and by means of a registering apparatus changes in the level of the deep water (as distinguished from the surface water) can be ascertained. A study of these changes conveys the idea of a train of big submarine or boundary waves. This wave movement seems to have its origin in the deep water, as the surface water enters or is expelled from the fiord, whenever there is a subsidence or upheaval of the deep water. There are small boundary waves of two to three days' period, which are evidently seiches of the deep water inside the fiord,

since they do not correspond to analogous movements of the deep water of the Skagerrak outside the fiord, and there are great boundary waves of thirteen to fourteen days' period, which are not confined to the fiord, but are in most cases felt to the other side of the Skagerrak. The great boundary waves seem to correspond in their period with the changes in the position relatively to the earth of the sun and the moon; (*a*) the regular train of such waves begins with the autumnal equinox and ends in the following April, the biggest waves thus occurring when the earth is in perihelion; (*b*) the phases of the moon, but still more, its declination and distance from the earth, seem to have influence upon the occurrence of the big waves.

"It seems obvious that the motions of the deep water are of a tidal nature, and it seems possible that they belong to the special classes of such phenomena called tidal seiches, *i.e.*, movements of the waters of a limited basin caused by the passages of the oceanic tidal waves over its threshold. To investigate this theory, tank experiments were conducted, from which it would appear that the original tidal wave, whether it be forced or free, is modified by its impact upon every submarine ridge it encounters, and gives birth to tidal phenomena of various kinds which can, however, always be recognised by their periodicity.

"The occurrence of big boundary waves seems to exercise an influence upon the arrival of the herring shoals on the coasts of Sweden in autumn and winter. It is well known that the fish life of the ocean has its highest frequency where the movement of the waters is most intense. Investigations show that since 1753 the herring fishing has been most prolific in years of maximum declination of the moon and least prolific in years of minimum declination. A high declination causes a more energetic movement of the waters of the innermost parts of the North Sea and its inlets. In summer the herring shoals are spread over the whole northern plateau of the North Sea, and in winter are found concentrated in the eastern and southern parts. The chief agent is the sun's declination (and the earth's perihelion), which causes the yearly period. The influence of the moon, on the other hand, upon the movement of the deep water causes the periods of abundant and scarce fishing every eighteenth or nineteenth year."

On Monday, September 4, a joint-meeting was held with Sections K (Botany) and C (Geology) for the discussion of the question as to the "Relation of the Present Plant Population of the British Isles to the Glacial Period." The discussion was opened by Mr. Clement Reid in the following paper, which we quote in full as printed in the official abstract:—

"The distribution of our British plants has long been a puzzle to the botanist, and no explanation was forthcoming till the cause was searched for in bygone changes of climate, and changes in the distribution of land and sea. A century ago it was generally supposed that species had originated mainly in the districts in which they were then found. But even under this hypothesis the anomalies of discontinuous areas seemed to require explanation, for the same species was not likely to originate at several different points.

"With the growth of the idea of gradual evolution it was realised that faunas and floras had a past history, even if the included species had remained unchanged. Botanists recognised that there were many points that required explanation. For instance, it was noticed at an early date that each of our mountain-tops possessed a small outlying fragment of the Arctic flora. How came it that the same species occupied so many different mountains? This seemed a perfectly fair subject of inquiry, even to naturalists who hated the very idea of evolution when applied to species and genera.

"More than sixty years ago a great impetus was given to this study by the discovery that Europe had passed through a most remarkable series of climatic changes, and that, too, during the lifetime of the existing species of animals and plants. There had not been a mere cooling of the climate: the temperature in these latitudes had sunk far below its present level, and then had again risen.

"Edward Forbes, in 1846, seized this clue, and explained through it as relics of the Glacial Period, the Arctic plants stranded on our mountain-tops: they were plants left behind when the climate became too warm for them any longer to survive on the plains. The subsequent discovery of fossil remains of these plants scattered over the plains, and often associated with relics of arctic animals now extinct in Britain, seemed a brilliant proof of Forbes's view, which has been generally adopted.

"In some curious way, however, botanists and zoologists both seem to have overlooked the difficulty that, granting Forbes's hypothesis to be sufficient to account for our alpine flora, it rendered more difficult instead of easier the explanation of our southern flora, which occurs in a similar way stranded in some of the warmest low-lying parts of Britain.

"We meet to-day to discuss this question, in the hope that botanists, zoologists, and geologists may realise each other's difficulties, and may be able in combination to give a clear teaching on this important problem of geographical distribution.

"The discussion I have been asked to open is limited to the relation of the present Plant Population of the British Isles to the Glacial Period. Our problem is a special one: it is not the same as that which confronts the botanist on the continent of Europe or America: and it is not the problem of the origin of the flora of an oceanic island. Also, the wider question of the origin of the species composing the British flora is outside the discussion, for it would lead us into too many untrodden by-paths, and could not satisfactorily be gone into in the present imperfect state of our knowledge.

"Perhaps it will be well to explain at once why the inquiry is thus limited to comparatively recent periods, and how it is that we need not explore the unknown earlier periods and deal with larger questions.

"Our first inquiry in this case must be: Has there been any continuous occupation of Britain by a temperate flora and fauna from pre-Glacial times to the present day? Or, to put it in other words: Are any of our plants survivors that managed to live through the cold of the Glacial Period in some warm nook in Britain? They evidently found a

refuge somewhere, for we know that the same temperate species that live in Britain now were here in pre-Glacial times. But was this refuge in Britain?

"Here geology comes to our aid, and I think that all geologists who have made a special study of the climatic conditions will agree with me. Any survival of our flowering plants, except in the case of a few Arctic and Alpine species, was quite impossible.

"It may come as a shock to some of my colleagues when I say that for this particular discussion we have a perfectly definite starting-point. We have merely to account for the incoming of our existing flora, after an earlier assemblage had been swept away almost as completely and effectually as the celebrated volcanic eruption wiped out the plants of Krakatoa.

"In order to make clear the existence of this limitation, and for the convenience of the discussion, I have prepared certain maps, which are now shown. I propose now to say a few words as to the bygone climatic and orographic changes indicated on those maps, and on their bearing on the existing flora of Britain. I must say at once, however, that you must not take these maps as absolutely exact statements as to the climatic and geographic conditions at the different stages involved in our inquiry. But they give the result of many years' work at this subject, and, I think, may be accepted as embodying the main efforts which dominate the question we have to discuss.

"We know that during the greatest intensity of the cold, all Scotland, Ireland, and the greater part of England, were buried under ice and snow—except, possibly, for some high peaks on which a few Arctic species survived. Ice filled the North Sea and covered the lowlands of England down to the mouth of the Thames. Without crossing the Thames it almost reached London. Its southern limit stretched to South Wales, where tongues of ice reached the Bristol Channel in big glaciers like those of the Antarctic regions or Greenland. In South Wales a few hills may have escaped, though surrounded by ice.

"The glaciation in Ireland was even more extreme, for apparently no part of Ireland escaped. Even the warmest parts of the south-west are striated and covered by morainic material, the ice extending well out into the Atlantic. The icebergs were so big, or the ice-foot so thick, that, breaking away from the Irish coast, the masses were able to float across to the Scilly Isles before they melted; for they carried with them numerous striated stones of well-known rocks, now found stranded on the highest parts of the Isles of Scilly. Thus it is evident that in those days Scilly, our most southerly and warmest point, was surrounded by a bitterly cold ocean, and it was submerged to such an extent that it could be overridden by pack-ice. Could any temperate plant survive such treatment? I particularly want you to realise the climate that Scilly enjoyed in those days, for it is now one of the warmest spots in our islands, and its temperate flora has come back, though the islands are surrounded by fairly deep sea.

"It seems evident, therefore, that a temperate flora could not have survived the cold in Ireland or in the Scilly Isles. But there is still the non-glaciated area south of the Severn and Thames to consider, and botanists may tell us that the temperate flora survived in some warm

nooks in Devon or the Isle of Wight. Here, however, we can point to evidence that the botanist himself must accept as conclusive.

"In the south of Devon one of the warmest of the sheltered valleys is that through which the Teign flows to Newton Abbot. But in the alluvial deposits of this valley, and only a few feet above the sea-level, Professor Oswald Heer and Professor Nathorst discovered leaves of the dwarf Arctic birch and some Arctic mosses.

"Time will not allow us to go into all the evidence; so I will only point to one or two other areas which prove the extreme rigour of the climate in the south of England. Close to Salisbury are found in profusion remains of various Arctic mammals—reindeer, musk-ox, Arctic fox, lemming, and several others. Unfortunately, plants do not seem to have been searched for, and the sections were obscured when I visited the pit: however, the flora associated with this assemblage of mammals can only have been the flora of the Arctic regions.

"To come nearer home, around Portsmouth itself, we have abundant evidence of this icy sea, for in the peninsula of Selsey especially we find numerous large erratic blocks floated by ice. Some of them have been identified as coming from the Isle of Wight, others from Bognor and Cornwall, and a number came from the Channel Islands. Thus even the north coast of France had its shores fringed with ice.

"I have attempted to show on a map what the Channel was like when Spithead was thus blocked with ice-floes. Is it possible to believe that the plants of the south of England, many of which can barely hold their own during a severe winter nowadays, could have survived these Arctic conditions?

"If the southern plants were completely swept away by the cold, the question arises: How did they come back again, especially to islands like Ireland and the Isles of Scilly, and how did they obtain their very singular present geographical distribution? We are told that the matter is simple enough, for Britain has often been connected with the Continent, and the plants spread slowly overland. However, before we adopt the view that for animals and plants to spread to islands it is needful to have land-connection, you should remember Krakatoa, and the rapidity with which the exterminated flora has come back. Also I must point out that there are peculiarities in the distribution of the different elements that go to make up the existing British flora that no land-connection will explain. Look at the recent distribution. One of the most striking peculiarities is the Pyrenean element in our flora. It is practically confined to two areas, the one in Cornwall and the other in the West of Ireland. Geologists nowadays will not agree to the reconstruction of a lost Atlantis to account for this peculiar distribution.

"Undoubtedly since the Glacial Period our islands have seen several oscillations of level. There has also been widening and narrowing of straits and channels. England has been connected with France near Dover, and also across the North Sea with Holland and Denmark. But twenty or twenty-five metres seems to have been the approximate extent of the rise in the South of England. I have searched in vain for evidence of a greater movement. A shallowing of the sea by twenty-

five metres is not nearly sufficient to connect Ireland with England or Scotland, or the Isles of Scilly with England. Still less would it suffice to connect the West of Ireland or Cornwall with the Pyrenees, where the peculiar plants find their home. A rise of land to this amount would not even bring Scilly and the Land's End appreciably nearer together.

"This limitation of the extent to which we can bridge over the gaps between our islands is, however, a point on which there is much difference of opinion, and I will not insist on the conclusiveness of the evidence as to the extent of the oscillations.

"From the botanist's point of view there are, however, other archipelagos besides those surrounded by water. No doubt if we can postulate sufficient orographic changes, plants would spread slowly from land to land during the few thousand years that have elapsed since the cold died away. But—and this 'but' is all-important—they would only do so if the soils were suitable. An isolated tract of limestone surrounded by clay or by sand is as much an island, as far as many of our most peculiar plants are concerned, as if it were surrounded by water. We have many such islands—or oases is perhaps a more suitable term for them—and no possible ups and downs of the land will connect them. Many of them, like the central limestone district of Ireland, or the peak district in Derbyshire, or the West Yorkshire carboniferous limestone, must have been isolated from far-distant geological periods, from times before the present flora of Britain had any existence. We have a still more difficult problem than this. Britain is divided into numerous river-basins, for most of which any connection with other basins in post-Glacial times is unthinkable. Yet each basin yields numerous aquatic plants and animals of the same species as those found in other basins cut off by high hills. Isolated lakes have their aquatic flora: and even artificial ponds, such as the dew-ponds of our high chalk downs, have a fauna and flora closely proportionate in the number of species with the time that has elapsed since the pond was made, or since it last dried up. If no actual connection between river-basins or isolated ponds is needed for the spread of aquatic plants, why need we postulate a land-connection for the land-plants, or a bridge of limestone to aid the migration of the limestone plants from crag to distant crag? Aquatic plants and limestone plants must obviously in most cases have taken leaps of many miles to arrive at their present stations. Our plants have far greater power of crossing deserts and seas than most botanists are willing to allow.

"Let us examine the present distribution of one of the most interesting groups of British plants. The Atlantic or Lusitanian plants form an assemblage belonging mainly to the Pyrenees, and found also in the S.W. of England, and again in S.W. Ireland. But they do not occur in the intermediate districts. If we look more closely into the composition of this Atlantic flora, as it is represented in Britain, we find that only plants with small seeds have been able to cross to Cornwall and Ireland, those with large seeds being left behind on the Continent. There is only one tree among them, and that is the *Arbutus*, one of the few trees

with minute seeds now living in Europe. A further examination confronts us with the puzzle that, whilst various Pyrenean species are found also in Cornwall and Kerry, the species occurring in Cornwall and Ireland are not the same. The *Arbutus* is a case in point; it is wild in Ireland, but in no part of England. *Erica ciliaris* and *E. vagans* are English, and not Irish: *E. mediterranea* is Irish, and not English.

"The local distribution of these plants is equally strange. A few, like *Pinguicula lusitanica*, have spread throughout the west country, wherever the conditions are suitable. Most occur, however, in quite different fashion: they are abundant over certain limited areas, to which they are strictly confined, but they are absent from other adjoining areas, though equally suited. I have mapped and examined a good many of these areas, and the plants seem in most places to be spreading vigorously from certain definite centres, to which chance has transported a seed. Thus, *Erica ciliaris* is confined to two areas, one in Cornwall, the other in Dorset. *E. vagans* occurs abundantly in the Lizard and again on quite different soil in North Cornwall, so that the serpentine soil has nothing to do with its present distribution.

"Chance introductions of seeds during thousands of years explain the existing peculiarities of geographical distribution in a way that no changes of sea or land or climate will do. Our Alpine flora consists largely of survivors from a colder period: the rest of our flora, on the other hand, is constantly being added to by chance introductions from the nearest continental shore. That is why the Atlantic element, and the eastern element, though not consisting to any great extent of maritime plants, are confined mainly in Britain to areas within a few miles of the coast. Seeds are evidently brought from the Continent and scattered broadcast over certain coastal districts, and they grow and spread where soil and climate are suitable. But the post-Glacial period has been so short that the process is still incomplete, and the slow spreading inland has only as yet extended a few miles. We can still fix the point or points of introduction.

"The most striking elements in the British flora, except the Arctic and Alpine species, have a marked coastal distribution. The plants found correspond with those of the land opposite (in which they are often inland, as well as coastal). Thus the Cornish plants and those of S.W. Ireland contain a large Pyrenean element; Norfolk plants correspond with those of the opposite shore of the North Sea; even two or three American plants are found on the coasts facing America.

"All the evidence seems, therefore, to point to a steady change and increase in our flora, due to occasional introductions. These introductions are, I think, now mainly due to birds driven by exceptional gales. But herds of migrating bison, deer, and horse have played their part, especially when the Straits of Dover were much narrower or non-existent. Packs of wolves which hunted the large game, foxes, cats, and especially raptorial birds which waited for and struck down the tired migrants, must also have assisted. Fences and the destruction of wild animals have probably rendered the process far slower than

formerly; but it still goes on, as any one can see who notes the constant occurrence of seedling oaks miles from the nearest tree.

"If I am right, therefore, there is no such thing as a native plant in Britain. Our flora has been swept away like that of Krakatoa; but we have arrived at a much later stage of the re-peopling in our islands. It seems to me far more interesting to watch this process of introduction, change, and spreading, than to enter into speculations as to what species shall be listed as 'natives,' 'denizens,' or 'colonists.' No such differences exist; it is all a question of degree.

"Britain for several thousand years has been receiving colonists from all sources, and the process still goes on. The oldest element in our flora, the Alpine, occurs on nearly all our mountains; for it once occupied the intervening areas, and it does not greatly depend on conditions of soil. The limestone, aquatic, and Lusitanian floras, on the other hand, are more recent introductions; they can never have occupied continuous areas, and their present distribution is full of singular anomalies. These three elements of our flora are steadily growing in importance, whilst the Alpine element is stationary, or tends to die out."

After the delivery of Mr. Reid's paper a letter was read from Dr. A. R. Wallace in which the latter said that while he accepted Mr. Reid's view that a large number of the British species of plants had been introduced into the country over the ocean, he was not prepared to admit that all had originated thus. He expressed the opinion that temperature is only one of many factors which determine the distribution of species, and that at the southern edge of the ice sheet the winter temperature may have been mild enough to support a large number of plants. He added that there seemed to him no reason why hundreds of species might not have been living in the south of England since the Pliocene Period, the winter covering of snow being a compensation for the lower temperature of the air during the rest of the year.

In the discussion that followed Dr. Scharff of Dublin gave it as his opinion that there was a wide pre-Glacial land connection between England and Ireland, for only thus could the presence of large mammals in Ireland be explained.

Dr. Arber, of Cambridge, expressed the opinion that the immigration of Alpine plants did not come from the Arctic at all, but from central or northern Asia. That would increase Mr. Reid's difficulty as to how those plants got into Ireland. He accepted the theory that there was possibly a land connection between Great Britain and Ireland, but after the main period of Glaciation. On the other hand, Dr. Druce, referring to Dr. Scharff's view, said that if the existence of wild animals in Ireland was accounted for by a former land connection between England and Ireland he could not understand why the mole and the viper, found in England, did not occur in Ireland.

In the afternoon Captain C. G. Rawling, C.I.E., gave an account of the British Expedition to New Guinea, in which he said that the object of the expedition, which was organised by the Ornithologists' Union, assisted by the Royal Geographical Society, was to survey the south-western part of Dutch New Guinea, and to study the flora and fauna of

the district. The expedition was led at first by Mr. W. Goodfellow, who acted as ornithologist, and after his departure by Captain Rawling. A landing was effected near the mouth of the Mimika river, where a base camp was formed. The party then advanced along the Mimika to Parimau—thirty miles in a direct line from the coast—where a base was established. The whole of the intervening country was found to be covered with a dense growth of Pandanus, Artocarpus, Ficus, Rattans, and other plants. From Parimau attempts were made to penetrate into the mountains, but at first with little success. The Mimika proved useless as a means of advance, and the expedition was forced eastwards across and along the great rivers Kamura, Wataikwa, and Iwaka. A branch of the Wania was then followed for some distance, after which the exploring party made for the foothills, eventually reaching an elevation of 6,000 feet. Here a magnificent view was obtained. To the south lay the densely forested plains and foothills, while to the north was the Nassau Range with its precipitous front, which is over eighty miles in length, and varies from 8000 to 10,500 feet in sheer height.

Among other results of the expedition large and valuable collections of birds and animals were made, together with botanical and ethnographical specimens. A new and unknown race of pigmies was discovered and studied; over 3000 square miles of country was surveyed and mapped; and the impossibility of the Mimika, and the value of the rivers further east, as a line of advance to the snows was ascertained.

On Wednesday a discussion on Aeronautical Maps took place, which was opened by a paper by M. Ch. Lallemand, President of the French Association for the Advancement of Science, on International Air Maps and Aeronautical Marks. The author described the resolutions recently adopted, at his suggestion, by the Permanent Committee for Aerial Navigation of the Public Works Department of the French Government, on the subject of the production of an International Air Map and the establishment of the marks required by aviators and aeronauts. The map, designed on the scale of 1 to 200,000, after a provisional model submitted by the Aero Club, will be a subdivision of the "International Map of the World," on the scale of 1 to 1,000,000, for the production of which a common agreement was recently arrived at between the principal states of the civilised world. Each sheet of the air map will cover an area of 1° in longitude by 1° in latitude. Twenty-four sheets of the same map will cover the same area as one of the sheets of the International Map on the scale of 1 to 1,000,000, since each of the latter covers 6° in longitude by 4° in latitude. In order to avoid the troublesome distinction between eastern and western longitudes, northern and southern latitudes, with the inevitable errors caused by the change of sign, the longitudes are to be reckoned from 0° to 360°, in an easterly direction, extending from longitude 180° E. or W. of Greenwich. In addition, there will be given, instead of latitudes, polar distances, reckoned from 0° to 180°, extending from the South Pole, in order that, in the northern hemisphere, where lie most of the inhabited lands, the numbers may increase in the customary way with increasing distance from the equator. Each sheet will be numbered by the co-ordinates of its south-western corner.

In addition, marks, each of which is the distinguishing figure of half a rectangle, with the small sides duly set towards North, should be drawn on the roofs of convenient buildings or on the ground itself. Each of these marks indicates the northern or southern half respectively of the corresponding sheet of the aeronautical map. On each mark a large dot will indicate the proper position occupied on the sheet itself by the mark on the ground. Moreover, two large figures will be marked on each side of the rectangle, set towards North ; the left one showing the number of the units of degrees of the latitude of the mark, and the right one the number of the units of degrees of the longitude. A mistake of 10°, say 400 miles in the direction of the parallels, or 700 miles in that of the meridians, being scarcely probable, these two figures will suffice to define the number of the corresponding sheet of the map and the rough co-ordinates of the mark.

If the example thus given by France should be followed by other countries, an international agreement would be necessary to fix positively the conventional signs of the aeronautical map and other particulars.

In the discussion which followed, Captain H. G. Lyons emphasised the importance of co-operation between the cartographer and the airman. He supposed the accurate rendering of the form of the ground was almost essential, and the airman would wish to know not only the slope of the ground, but in many cases its actual altitude. He believed that for this purpose opinion on the Continent was largely in favour of the use of layers of colour, and that while some inclined to a few colours strongly contrasted, in other cases a complete grading system was preferred, with colours so selected as to give an impression of actual differences of form. The question of detail was very complicated. Main roads, railways, and rivers were of course essential ; but in regard to secondary roads there was some difference of opinion. Water channels of all kinds must be strongly brought out. Experiment was necessary to ascertain what was the most serviceable method of representing settlements, buildings, and so forth. Special objects were of far greater importance than in a topographical map, and in addition to places likely to be dangerous there would no doubt have to be incorporated, as our knowledge of the air improved, warnings of a meteorological character in certain districts.

Professor J. E. Petavel hoped the map would indicate positions which were dangerous owing to habitual disturbances in air currents or owing to the impossibility of landing within a large radius of the point. He was afraid that landing-places would add to the complication of the map, but very often, going between two places, it was possible to select a route which would pass over fields reasonably safe to land on instead of over districts in which landing might be highly dangerous.

Major Sykes said it was wisely decided at Brussels that if a general system could be settled an experimental period would be necessary to establish unknown factors. There must still be necessarily a great divergence of opinion about maps and signals, and he was afraid it was still unwise to decide on any definite scheme which would involve much expense. The best scale, it seemed to be agreed, was 1 : 200,000 for

long-distance work. For military purposes perhaps two scales would have to be used. The elimination of detail was a very serious point. There must be as much elimination from the airman's point of view as possible. In his opinion some form of arrangement of International conventional signs would be so advantageous that an effort should be made in that direction. Except for small areas, he thought there were hardly sufficient data at present to start a system of locating adverse meteorological conditions.

Mr. Bertram Cooper urged the advantage of a constant interchange of opinion between the cartographer and the airman. It was a question whether the military and naval airman and the amateur could really have one map to suit them both. Would it not also be better to make a separate meteorological map?

The President (Colonel Close) said that much more experiment and trial would be necessary before agreement was reached, but he thought there was a tendency to unanimity on the main outlines.

Various papers, with a more or less direct bearing upon geography, were read in the other sections. Thus in Section A (Mathematics and Physics), Prof. J. W. Humphreys, of the United States Weather Bureau, read a paper on "The Earth as a Radiator," in which he said that our climates were not now growing either colder or warmer, the total heat received from the sun being equal to the loss through radiation during the course of a year. But such equality did not hold either for shorter times or for long or short periods over limited parts of the earth. The rate of gain was exceedingly variable and ranged from zero to an absolute *maximum* of two calories per minute per sq. cm. Though the instantaneous *maximum* was on the southern tropic, the *maximum* 24-hour gain was at the South Pole. On the other hand, the rate of loss was more regular than the gain due to the storage of sensible heat in the soil, air, and water and its gradual but continual emission, and also because of the latent heat of fusion and evaporation through the operations of convection. The chief equaliser of temperature was the process of evaporation and condensation, a considerable part of the heat received at the warmer parts of the earth being entrapped there and carried to colder ones for liberation and radiation into space. Another important factor was the height, nature, and distribution of clouds. The low-lying clouds of high latitudes were below the radiating level and but slightly affected outgoing radiation, while very high clouds, common to the tropics, were above the radiating level; hence, on account of the large co-efficient of absorption of water vapour for long wave-lengths they allowed solar radiation through, but prevented loss of earth radiation into space. The high cirrus cloud could alone check the outward flow of radiation. By mapping the earth in zones in respect to the intensity of outgoing radiation it could be seen that, as a radiator, the Equatorial zone was the least effective.

In Section C (Geology), Dr. W. F. Hume and Mr. J. I. Craig were the joint authors of a paper on "The Glacial Period and Climatic Changes in North-Eastern Africa." Having first described a southerly shift of the wind systems in glacial times, they referred to the evidence of an

enormous development of glaciers over Ruwenzori, Mount Kenia, Kilimanjaro, and the Himalayas during the Glacial Period. The recession of the glaciers in East Africa indicated that the temperature there was now about 10° to 12° F. warmer than during the period of *maximum* glaciation. It was known from the investigations of the Meteorological Department of India that an increased snowfall on the Himalayas in spring exercised a measurable prejudicial effect on the Indian monsoon at the present day, and they might infer that the enormously greater ice-covering of the Glacial Period would exercise a much more powerful inhibition on the monsoon of that period. The more extensive ice sheet of East Africa, by preventing abnormal heating of the land in summer, would act still further in the same direction, and it was extremely probable that the monsoon current partook of the southerly displacement of the wind system already referred to. The general result would be a decreased precipitation over Abyssinia and a much reduced Sobat, Blue Nile, and Atbara, which at present accounted for 96 per cent. of the flood proper of the Nile. The geological history of the Nile entirely accorded with these inferences. One of the chief results of the present monsoon rainfall had been the deposit of finely divided muds, brought from the Abyssinian hills, in the Nile valley. To the south of Cairo these deposits were at most of 30 feet to 35 feet thickness, of which 10 feet had been laid down since the time of Rameses II. If conditions had remained uniform this would give a date 14,000 years ago for the first deposits of alluvial muds in Egypt. Previous to this the mud-laden waters of Abyssinian Nile system did not reach Egypt, as the waters of Khor Gash now failed to reach the Nile, and so geology and meteorology concurred in indicating a much weaker rainfall in Abyssinia during the Glacial Period.

In Section F (Economic Science and Statistics), Mr. J. Howard Reed read a paper on "India with Respect to the World's Cotton Supply," in which he showed that cotton is grown in India by very primitive methods, and that the crop could be greatly increased, and the quality improved, by the introduction of better methods of farming, and the removal of various disabilities under which the cultivator at present works.

Mr. Sigmund Stein read a paper in the same section on the "Economic Aspects of the Introduction and Establishment of a British Beet-Sugar Industry," in which he dealt upon the advantages which would accrue from the growing of sugar-beet in this country on a commercial scale.

The 1912 Meeting is to be held at Dundee, under the presidentship of Prof. E. A. Shäfer, and will open on Wednesday, September 4, while an invitation from the city of Birmingham has been accepted for the year 1913.

The number of members attending the Portsmouth Meeting was 1210, as compared with 1450 in Sheffield last year.

LIFE IN A FRENCH UPLAND REGION.

We gave an account here a month or two ago of life in the Scottish Highlands as it was before railways reached the region. With this it is interesting to contrast life in a somewhat similar part of France. An interesting article, with map and illustrations, appears in a recent issue of the *Annales de Géographie* (July 15), in which Professor Demangeon of Lille describes in detail life in a part of the old province of the Limousin, called by its inhabitants the Mountain. The Limousin now forms the department of Corrèze and part of Haute-Vienne, and the particular region described lies almost on the confines of the Auvergne, on the high plateaux whence descend the Creuze, the Vienne, the Vézère, the Corrèze, the Luzège, and the Diège. Here the altitude, which is always above 2400 feet, and sometimes reaches 3250 feet; the climate, with its heavy snowfall, cold winters and frequent storms; the soil, which is shallow, sandy, poor, and light, all tend to create a particular type of human life, closely related to the physical conditions.

Bogs and marshes are frequent, and are fed by the almost constant rain; there are great areas of heaths and moors where sheep feed, and agriculture is carried on by primitive methods, so that the whole region tends to be given up to the pastoral industries. Nevertheless there is a sharp contrast between this region and the richer and more fertile Auvergne district to the west, which, though higher, carries many cattle and produces both milk and meat, while the poorer natural pastures of the Limousin Mountain mostly carry sheep. The contrast with the lower grounds in the Limousin is even greater. The latter form regions where wheat replaces the rye of the mountain, where chestnut groves extend over large areas, and where all sorts of farm animals can be reared. The economic relations emphasise the individuality of the Mountain, for round its margin market towns and villages cluster, where the products of the high ground are exchanged for those of the low.

The utilisation of the soil in the mountain is determined by the physical conditions. The rocks are crystalline, and the area is an ancient surface of denudation, with softened outlines and rounded contours. The land lying over the summits and on the slopes bears a light gravelly soil, which has had all its fine particles leached out, and is therefore dry and barren in summer and soaked with water in winter. Such areas are clothed in heather and moor plants. Where it is cultivated the surface soil is only some five to eight inches deep, and will not produce root crops or leguminous plants, but where it is not too dry it yields good crops of rye and buckwheat.

The finer particles accumulate on the valley bottoms and at the bases of the slopes. Here the surface soil may be twelve to sixteen inches deep, and is relatively rich in potash and soda and even in chalk. These are the fertile areas, but they only occur in patches, and not all the villages possess such lands. Owing to the gentle slopes, the valley bottoms tend to be marshy, and are then covered by aquatic plants,

which afford only poor pasturage. Such lands require drainage and dressings of chalk to be of any use for crops.

The lands of the area thus fall from the farmer's standpoint into three groups. The high and sloping ground forms a region of poor hill pasture, grazed by sheep; the fertile areas are of small size and are used for those crops which will stand the climate; the marshy regions again form poor pastures. Thus the arable land is as it were compressed between the barren uplands and the useless marshes, and forms merely oases in the general waste.

The severity of the winter is a great bar to free communication. The snow lies upon the ground for periods varying up to three or four months, when locomotion has to be by sledges. The chestnut and the various fruit-trees will not stand the climate, and oak and beech are limited to the lower levels.

The winter months, when communication with the outer world becomes difficult, are the great season for village reunions. These often take place in the barns where the sheep are folded. Here the women spin wool or hemp while the men plait straw for baskets, bee hives, and so forth.

The length of the winter makes it necessary to hurry through agricultural work in the short time available. Rye is sown towards the end of August or the beginning of September, and sometimes remains eleven months on the ground, for it may not be reaped till the beginning of the following August. Owing to the cold springs potatoes are not planted till April, and oats are sown even later. The harvest is always two or three weeks later than in the low ground, and exposure to the sun becomes of great importance in laying out fields.

As to crops, half the arable land is year by year laid down to rye, the local "corn." The other half bears potatoes, buckwheat, and often oats. Occasionally kohl-rabi and fodder crops are seen, but fertile land as a rule is too precious for crops destined only for the use of animals. The crops are not grown as articles of merchandise, but to meet the needs of the district. The rye makes the local bread; the buckwheat feeds the pigs and is also used to make a kind of pancake which is a daily dish; the oats are needed to fatten the sheep, while both man and beast eat potatoes. Formerly each family contented itself with rearing one pig for home use, but now, with the better opening up of the country by road and rail, the inhabitants are beginning to raise pigs for market. The young animals are bought from the low country, and are fattened on the buckwheat, potatoes, and even on the oats and rye, formerly too precious for such animals. The fat pigs are then sold to the distant markets of Paris, Lyons, and Bordeaux.

The difficulties of communication long prevented the region from obtaining artificial manures and fertilisers, badly needed by this barren land. The original method of cultivation, now dying out, consisted in collecting turf and peat from the heaths, making the pieces into heaps and burning them. The ashes were then spread over the land, and ploughed in. Such land would produce two crops, and then was allowed to revert to pasture for many years, before being again ploughed. The difficulty

in obtaining manure may be gauged by the fact that it is still the custom to spread ferns and heather in the streets of the villages, in order that they may be used later to enrich the lands.

Agricultural implements are of the most primitive kind. The plough, of antique form, is drawn by two oxen, often guided by a woman, as the men emigrate. Threshing is carried on by means of flails in winter, and in some cases the threshing is done bit by bit as the need arises for more flour. Here and there common mills still occur, whither each peasant goes to grind his own grain, then leaves the key in the door for the next comer, and returns home with his flour. As there is no means of bolting the flour at the mill, it is sifted at home through a sieve.

But it is the mountain pastures which constitute the really important part of the region. Wherever possible irrigation is employed, or drainage, where this is necessary, in order to increase the yield of hay. The region is one of innumerable springs, whose waters issue clear from the granitic rocks, but are nevertheless loaded with dissolved mineral matter. This water is carried to the meadows in shallow channels, especially in the spring months, and the meadows themselves are improved by all the resources at the farmer's command. It is commonly said in the lower ground that the mountain folk live upon sheep, and without the carefully stored hay the flocks could not be kept alive through the winter.

But however carefully the hay be husbanded it is not sufficient to maintain all the animals which are born on the heights, and therefore a certain amount of stock must be sold each autumn. Let us take first the cattle. In the region generally, oxen form the only draught animals, both for drawing the ploughs and for carts. A certain number of calves must therefore be reared for the immediate needs of the district. The rest fall into two sets. Some are sold as young animals for food. Veal forms almost the only butcher's meat in the neighbourhood—a curious fact in a country of sheep, but doubtless explainable as the result of the value of the young males as future draught animals, and the consequent large production of female calves less valuable for this purpose.

The male calves may be kept for two or even three years, and are then sold at the great fairs for use as oxen on the farms of the low ground.

Sheep are much more abundant, and the mountain pasturage gives their flesh a particularly fine flavour. In summer they feed on the heaths, in winter they are folded and are only turned out to browse upon the twigs of gorse and broom when the snow is not too abundant. The greater part of their winter food is furnished by the hay made in summer. But the summer pasturages will carry more head than can be brought through the winter on the hay of the meadows. A certain number of animals then are bought in in spring and resold at the onset of autumn. Of those which are born on the mountain a certain proportion must also be sold as young animals, to be fattened for distant markets in the plains below. The larger proprietors succeed in fattening a certain proportion of their surplus stock themselves. The net result is that at the large fairs of autumn enormous numbers of sheep descend from the mountain to be sold.

Formerly these flocks of sheep constituted the sole surplus over daily needs which the mountain produced, but within the last half century or so another source of wealth has been added in the developing forests. The region, as already suggested, is not adapted for the trees of the low ground. On the wind-swept heights the oak becomes low and spreading, and is covered with mosses and lichens. Though it ascends above 2200 feet, yet woods are rare above about 1950 feet. The beech goes higher, and in sheltered situations makes long alleys even so high as 2600 feet. But neither tree can be said to form forests, and the country is not a region of wood. But, just as in the Landes, the pine has proved capable of withstanding the climatic conditions, and is being more and more planted. It is not necessary here, as in the steeper Alps and Pyrenees, as a means of protection against soil erosion; it is planted solely as an economic species. At first planting was opposed because of the possibility of the forests injuring the dominant pastoral industry, but this prejudice is gradually breaking down as it is proved that timber forms a remunerative crop over the sterile heaths, while improved means of communication make it possible to get more hay from the meadows by the addition of fertilisers.

The pine is therefore being planted in extensive woods, and some of the communes have even divided up the common grazings in order that individuals may plant trees on their share. Already the pine forests are beginning to change the aspect of the region.

The character of the dwellings and the distribution of property in land, no less than the crops, reflect the physical conditions. As to the dwellings it is noticeable that water and building materials are obtainable everywhere, so that these exercise no influence on the choice of a site. The solid rock lies but a short distance beneath the sandy soil, so that if no natural springs occur, water is always obtainable from shallow wells. Similarly stone is obtainable everywhere.

A good exposure, however, exercises a marked influence. Both for man and for his crops the sun counts for much, and southern and south-easterly exposures are the most favourable. The valley bottoms are avoided on account of the mists which lie here, and the tendency to frost in winter. It consequence the villages occur scattered along the hillsides, wherever a slope offers favourable conditions. It is the village which is the unit. Isolated dwellings are unusual, the houses occurring in small groups.

In regard to the dwellings, the chief feature of interest is the way in which the barns are constructed. These are always built against a slope, and consist of two stories. Below is the sheep or cowhouse, above the granary, and the whole is so arranged that the granary is flush with the ground at the back, so that the grain and fodder can be discharged into it direct from the level, while the flocks similarly enter their stable direct from the lower ground in front. This plan is economical of material and labour, while the fact that the granary is above ground level in front keeps its contents dry.

Owing to the barren soil the population is not very dense, some ninety persons being found per square mile. Even so the land will not

feed all, and the men, the younger men especially, emigrate to surrounding districts, though without losing touch with the locality, for local patriotism is strong.

For long ages it has been the custom for the men to migrate to other regions in spring in search of work, and documents of the seventeenth century speak of the annual departure of numerous artisans for Spain every spring, the return being made in November. Nowadays this type of emigration has diminished very much except in the poorest regions. There are still, however, a number of masons, carpenters, plasterers, navvies, and so forth, who leave the region every spring. Paris attracts a great many of these, the tradition dating from the time when the improvements effected by Baron Haussman made many demands on labour. These workmen leave in March or April, and return in November or December, so soon as the first frosts put a stop to their work. Meantime their wives and children and the old people have been left to carry on the work of the little farm. Sometimes the wanderers find work to last through the winter, and they then return with more substantial gains.

During a long period another group found work as sawyers. These left home on All Saints' day and returned at midsummer in time for the hay harvest. They found employment in the Pyrenees, the Jura, the forest of the Landes, and so forth. But the use of mechanical saws has diminished the demand for this kind of labour, and, oddly enough, it has been largely replaced by the occupation of cab or motor driver in Paris. For this purpose the peasant leaves his home in autumn, spends the winter and spring in Paris, and when his clientèle begins to disperse to seek the sea and the mountains, he returns to help his wife and the old people with the harvest.

Another mode of supplementing the yield of his poor lands which has been discovered by the ingenious peasant is that of selling wine. His own country does not produce a single vinestock, but wine-producing countries are near, and as travellers in this product the inhabitants of the Mountain have made the names of Limousin wines famous in regions where they were never known, and have brought comfort and even wealth back to their own villages.

Meantime, however, this extensive emigration makes the want of hands badly felt at harvest time in the Mountain. In the case of the peasant properties the women, children, and old men do all the necessary work; the larger owners have to import harvesters from the low ground.

Another curious result of the frequent emigration is seen in the desire of the people to learn. As in Scotland, schooling is highly prized among the peasants, who are thoroughly convinced of its value as an aid to money-making. The constant coming and going also creates and stimulates interest in the outside world. The returning emigrants bring back new ideas and new methods which are soon put in practice.

The object of all is the acquisition of more land, for nowhere is the land-hunger better marked than in the Mountain. If the peasant is willing to leave his home it is only to acquire means to buy another field, or to pay off a debt. Thus most emigration takes place from districts

where large properties are the rule and peasant proprietorship is thus excluded. Further, the land is not always divided up at the death of the head of the household as elsewhere in France; it is quite usual to find that it descends, either altogether or in greater part, to the eldest son, who is obliged to find money to pay off his brothers and sisters. It is with this object that he goes forth to seek for work and money. So soon as a small piece of land is put up for sale, many applicants present themselves, and barren as it is, the land fetches high prices. Professor Demangeon notes, as a curious little point, that when the working men in the large towns strike for higher wages it is often because of the call of the land in their native Mountain.

This greed of land is bringing about a number of minor changes in the distribution of property. Especially noticeable is the tendency to disappearance shown by common lands, more and more divided up among peasant proprietors, and the gradual reduction in the number of absentee landowners. The division of the communal lands was and is bitterly opposed by the large proprietors, who object to its division into equal parts, instead of upon the basis of the size of the flocks. But the division goes on none the less, for by it the small holders obtain new lands for growing rye and also regions capable of afforestation. The gradual growth of small holdings is aided by the diminution in the amount of labour necessary to work the larger. Thus holdings of from twelve to seventy-five acres increase in number, and each is cultivated by and for its proprietor.

Where land is rented the ordinary farm lease tends more and more to replace the system of métayage (payment in kind). Under the latter system the flocks belong to the proprietor, who decides all questions of buying, selling, and cropping. The system has the great advantage of permitting a peasant to cultivate without possessing much capital, but it is proving intolerable to the peasant of to-day, who prefers to pay a money rent and have freedom to follow his own ideas. Thus while métayage lingers on the large estates, the rent system appeals much more to the present-day farmer, who regards it as a stage in the acquisition of land.

It will be noted that recent developments in this barren upland region of France are very different from those which are taking place in the Highlands of Scotland, where the geographical conditions present certain similarities.

CONSTRUCTIVE WATERFALLS.

By Professor J. W. Gregory, F.R.S., D.Sc., University, Glasgow.

(With Maps and Diagrams.)

The excavation of valleys by waterfalls is one of the best known and most effective processes by which rivers cut down the surface of the earth. The influence of waterfalls is usually regarded as solely destructive, and as always helping to lower the land. They undermine and

cut backward the rock faces over which they fall: by this recession they excavate deep gorges: and the existence of these gorges enables the adjacent country to be lowered to the level of the valley floors. The waterfalls, moreover, empty any lakes they may reach in their retreat, while the ravines below the falls may drain the springs and thus desiccate the neighbouring highlands. Observations in various countries had suggested to me that waterfalls may sometimes be constructive instead of destructive, and that they may reverse their usual procedure, advancing instead of retreating, filling valleys instead of excavating them, and forming alluvial plains and lakes instead of destroying them. The best illustrations I have seen of such advancing, constructive waterfalls are on some rivers of Dalmatia and Bosnia, where they occur in various stages of development.

1. The Kerka Falls.

The famous falls on the Kerka river near Scardona, about ten miles north-east of the port of Sebenico, are a large example of the simplest variety of constructive waterfalls. The falls are over a bar of calcareous tufa, which they have built up across the Kerka valley. They are the chief falls on the Kerka river, and are well known, as they are easily accessible and are generally described as one of the most picturesque sights in Dalmatia. Their beauty is due to their terraced structure, the variety of the tufa platforms over which the water falls, and the luxuriant vegetation on the islands between the numerous branches of the river.

The falls are situated about three miles from Scardona, where the river is at sea-level. Above Scardona the Kerka valley is a deep trough cut to a depth of from 450 to 600 feet through a limestone plateau. The floor of the valley is flat and about 300 yards wide, and the walls are steep, smooth, and spurless.

The right or north-eastern bank consists of Eocene foraminiferal limestones, and the south-western side is of unfossiliferous Cretaceous limestones. The beds have a steep dip to the south-west and have been folded into an isoclinal.[1] From Scardona the valley goes first for a mile to the east-north-east across the strike of the rocks; it then makes a right-angled bend and continues as a strike valley for nearly two miles to the south-south-east. The rock-barrier at the falls is therefore at right angles to the grain of the rocks, and the existence of a bar of the Eocene or Cretaceous limestones, at or below the falls could only be explained by a fault which, if present, would be easily recognised on the bare sides of the valley. The Kerka river is about 180 yards wide below the falls. The difference between the levels above and below them is generally stated as 170 feet; but it cannot be more than about 130 feet. The greatest height of any one fall is about 25 feet, and the water descends in many channels by a succession of cascades.

The first natural interpretation of the falls is that the valley above them had been cut down to its base-level; that the country has been

[1] F. von Kerner. *Der geologische Bau des mittleren und unteren Kerkagebietes*, Verh. k.k. geol. Reichs, 1895, p. 425.

recently uplifted; that this elevation gave the Kerka renewed powers of corrosion; and that the valley above Scardona had been deepened by the recession of the waterfall.[1] There is, however, no evidence for any recent uplift of this area of 130 feet; on the contrary, the evidence is all in favour of its subsidence.

The only rock apparent at the falls is calcareous tufa, which has

been deposited from the water (Fig. 1). Hence if the falls had receded, masses of this would formerly have existed up to the level of the top of the falls in the valley below them. Most of this tufa would have been destroyed during the recession of the falls, but some of it should have been left plastered on to the sides of the valley. No doubt there are occasional deposits of tufa, especially on the right bank, which is the less regular: but I did not see any tufa that could be regarded as adequate

[1] The view that the waterfall has helped to deepen the valley has been expressed by F. von Kerner. *Op. cit.*, Verh. k.k. geol. Reichs, 1895, p. 427.

remnants of the thick masses that must have existed had the waterfall receded south-eastward up the valley.

There is no indication in the valley below the falls of any rock barrier that has been slowly cut away: the valley there is nearly 600 feet deep and the total height of the falls is only 130 feet. Hence on the view that the falls have receded upstream, the valley must have been cut in two stages at different times. The walls of the valley, however, exhibit no signs of any such double period of erosion.

The valley below the falls, therefore, gives no evidence that they were ever situated further down-stream; and there is nothing at them available as a waterfall barrier except the tufa. But the existence of an old rock barrier above the falls is easily explained. The valley makes a sharp turn and crosses the strike of the rocks. It therefore cuts through the band of Eocene limestone, which forms the high ground along the right bank below the falls, and extends on the left back towards Konjevrate. This rock doubtless once formed some obstruction across the river; and as the water is rich in bicarbonate of lime, the disturbance caused by this obstacle would have occasioned the decomposition of the bicarbonate and the deposition of the carbonate of lime as calcareous tufa. The original obstacle would therefore be raised and opportunity for the formation of tufa increased. The continuation of the process would form the waterfall barrier, which would be steadily raised in height, and would slowly extend down the valley.

No doubt some destruction of the tufa goes on simultaneously with its deposition. Masses of tufa are formed as projecting shelves which break away when they become too heavy for their slight lateral support. The appearance of the falls, however, indicates that more tufa is deposited than is worn away. There is no undercutting at the base. On the contrary, the tufa projects at the foot of the cliff and the talus of fallen blocks contributes to the advance of the fall.

Above the falls the floor of the valley is a plain of alluvium, and about 600 yards upstream the valley subdivides into those of the Kerka and its tributary the Cikola; and both valleys are occupied by long fiord like lakes: the Kerka lake extends for eight and a half miles to the north, and that of the Cikola for two miles to the east-north-east. These lakes are upheld by the tufa barrier. They and the alluvial plains beside them have therefore been formed by the waterfall.

As the tufa barrier is advancing down stream and is probably still being raised in height, the waterfall is tending to increase the length and depth of these lakes instead of gradually creeping toward them and destroying them by cutting through the embankment which upholds them.

2. The Topolje Falls.

The Topolje or Kerčić falls near the source of the Kerka river, two and a half miles east of the town of Knin, are less known and less accessible than the falls on the lower Kerka river at Scardona; but they afford especially clear illustration of the building up of a dam by waterfall action.

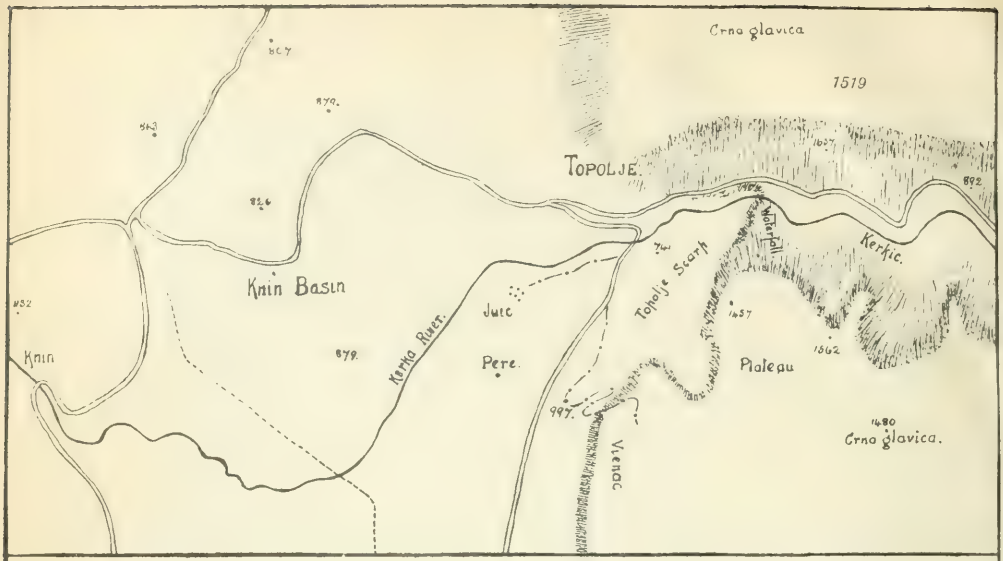

Fig 2.

0 ¼ ½ ¾ 1 Kilometres.

Sketch Map Of Neighbourhood Of TOPOLJE Falls

Heights in feet
Scale 1" = 37,500.

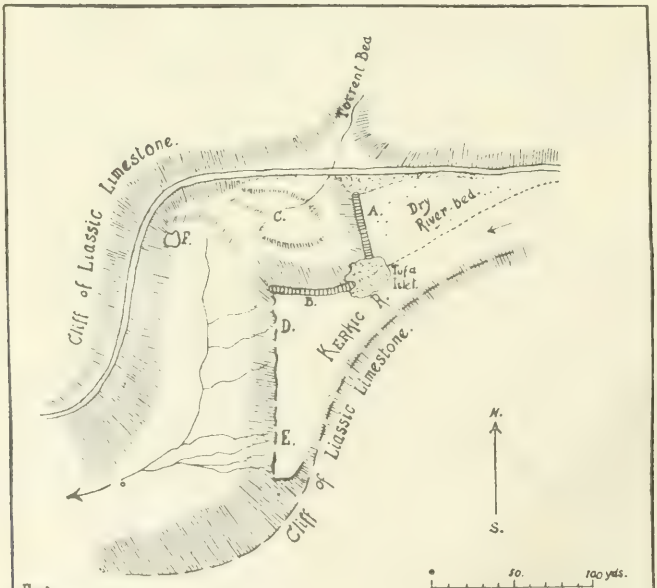

Fig 3.

PLAN OF TOPOLJE FALLS.

AB. Artificial Embankments.
C. Northern Section Of Fall.- Channel of torrent.
D. Central " " "
E. Southern " " ". F. Fallen block of Limestone.

The uppermost source of the Kerka river is on Mount Dinara, whence in spring and winter the water flows through a deep sinuous gorge to the basin of Knin (Fig. 2). This headstream of the Kerka is known as the Kerkic or Kerčić. It falls near the village of Topolje into the basin of Knin, which is there bounded by a cliff of highly inclined and contorted Lower Lias limestones abutting on Triassic dolomites. The cliff at Topolje is probably a fault scarp, and in spite of the steep inclination of its beds the cliff has been cut off above into a plateau with a remarkably level surface.

The Kerčić gorge has been cut through this plateau, and at its mouth its floor is level with that of the Knin basin. The gorge is crossed about 500 yards from its entrance by a cliff of calcareous tufa about 70 feet in height. Above this cliff the Kerčić flows through a sinuous mountain valley, which has a flat floor covered by alluvium. The valley above the falls is said to be dry during the summer, and the Kerka river then rises at the foot of the falls; they are therefore often referred to as the source of the Kerka river. At the time of my visit (30th April 1911) the stream in the upper valley had so large a volume of water that the falls and spray could be seen from the hillside at Knin.

Approaching Topolje from Knin, my first impression was that the falls were due to the Topolje fault, and that they were originally level with the Topolje scarp and had been cut back to their present position by the ordinary processes of waterfall excavation. This view was all the more natural, as Dr. Schubert[1] has referred to a mass of tufa near the point where the footpath to Juic branches to the west from the main road, as due to a former fall of the Kerka: and he suggests that it is "probably the old Topolje fall." Sir Gardner Wilkinson[2] in 1848 said that "the rocks at the falls are furrowed into deep smooth channels," and he clearly regarded the furrows as due to the ordinary erosion which causes the recession of waterfalls. Closer examination soon revealed serious difficulties in this hypothesis.

The general plan of the falls is shown on Fig. 3 from a hastily prepared sketch-map. The cliff over which the river falls crosses the valley obliquely, so that the water is discharged into a gorge parallel to the main face of the fall, as in the great Victoria Falls of the Zambesi. During full flood the falls are divided in three sections. At the north-eastern end of the cliff is the bed of a torrent, which comes down from the hills immediately to the north: it discharges into the head of the lower gorge. At the time of my visit this torrent was dry.

The main volume of water then fell over the centre of the cliff near the point D in Fig. 3. The rest of the water falls in a series of small streams through gaps (at E) in the rim of the projecting southern end of the platform.

I approached the cliff expecting to find that it was a bar of some hard band of the Triassic or Liassic rocks which are well exposed on the

[1] R. Schubert. *Geologischer Führer durch Dalmatien*, 1909, p. 105.
[2] J. G. Wilkinson. *Dalmatia and Montenegro*, 1848, vol. i. p. 223.

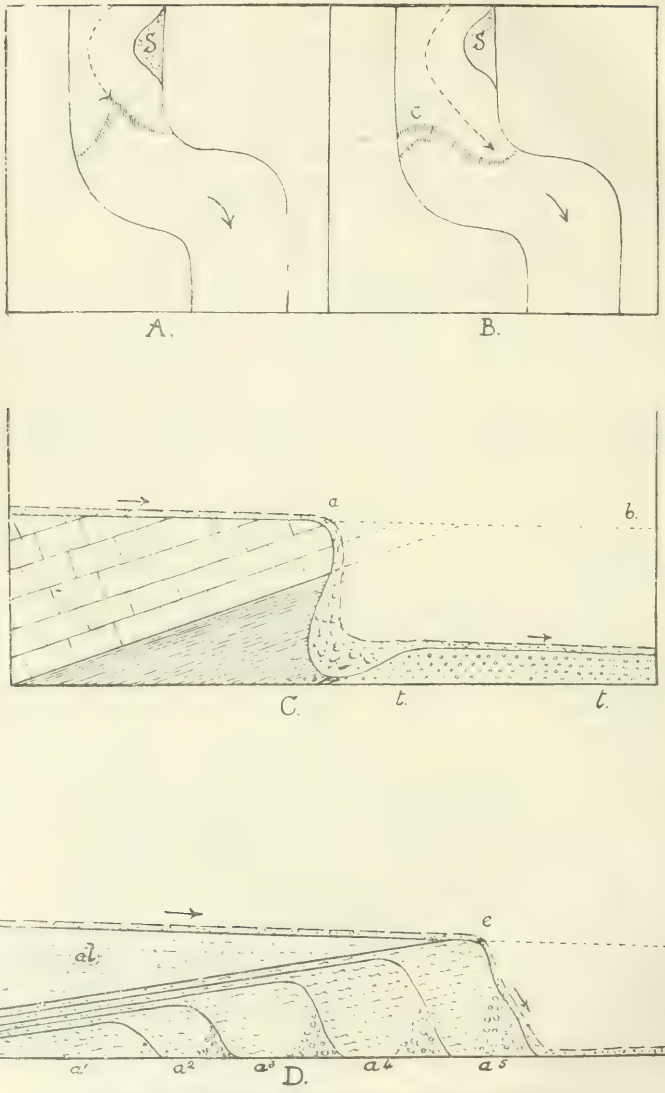

FIG. 1. Diagrams Illustrating the Topolje Falls.

A. The Topolje Falls as they would have been if due to recession by waterfall erosion, with a notch at the centre of the fall. S=shoal.

B. Plans of the Falls: the barrier projects below the main fall and is notched where the waterfall is weakest, at *c*, where the cliff is replaced by some tufa terraces.

C. Section through an ordinary fall due to the undercutting of shale beneath a hard bed of limestone: the fall forms a deep pool, which shallows downstream owing to the talus bank *t*; a, b, original level of the river below the fall.

D. Section through the Topolje Falls, a^1, the original tufa bar: a^2–a^5 the successive tufa bars: ~ ~ tufa: ° ° tufa-talus: *al.* alluvium: *e.f.* line along which there should be a tufa terrace if the waterfall had receded upstream.

bare cliffs on both sides of the gorge. I could, however, see none of these rocks *in situ* on the cliff forming the falls. Some blocks lying on the bottom of the gorge have fallen from the sides. All the rock exposed in the cliff is calcareous tufa; and that this material is not a thin crust covering Mesozoic limestone is clearly shown in the torrent bed (at C) on the northern side of the fall. Its channel shows a section 16 feet high of the rocks forming the cliff: but it has not exposed any of the Mesozoic limestone: the channel is cut through nothing but tufa of the usual many varieties, and calcareous sand. The whole waterfall cliff appears to consist of calcareous tufa.

I walked up the valley for a little distance above the falls, but saw no rocks *in situ* on the bed of the Kerčić. The river meanders across a plain of gravel and alluvium.

A further significant fact is the absence of calcareous tufa from the sides of the gorge below the fall. If the waterfall be slowly receding, then the platform above the falls must have continued to the Topolje scarp: and during its recession some of the calcareous tufa should have been deposited on the sides of the gorge. There is a little tufa immediately below the fall, but it is obviously due to the spray. There are also a few patches due to tributaries and springs; one such is cut through by the road on the right bank of the river, where the gorge widens out to the Knin basin; but the deposit is clearly due to a tributary which is now dry.

It may be suggested that the absence of tufa from the sides of the gorge below the falls is due to its having been removed by denudation: and though the material is much softer than the Mesozoic limestones it seems improbable that some patches should not have escaped destruction. Some traces of the old platform should remain as a terrace along the lower gorge, and some difference in weathering on the cliffs above and below the assumed former plateau might also be expected.

The shape of the falls moreover is the reverse of that of an ordinary receding waterfall, which is usually concave, the recession being most rapid in the centre of the stream where the volume is greatest and the cutting backward most powerful (Fig. 4, A and B). In the Topolje Falls, on the contrary, the cliff projects where the volume of water is greatest, as the deposition of tufa is most rapid there. The cliff is lowest, and there is a deep upstream notch where the water falls most rarely in the section fed by the torrent on the north bank. The largest fall of water has formed a projecting pier instead of a notch, and where the volume of water is least the barrier is lowest and most deeply notched.

It seems clear that the whole cliff is a bar of calcareous tufa deposited by the waterfall, and that this barrier is being slowly raised as it advances. The absence of tufa from the valley floor above the falls is probably due to its burial beneath the alluvium.

If this interpretation (Fig. 4, D) be correct, the Topolje Fall is being made by a dam which is advancing down-stream and leading to the formation of an alluvian plain behind it. The old gorge is being slowly filled up owing to the formation of the tufa bar, and when the falls have advanced a few hundred yards further, then the mouth of the Kerčić

valley will be flush with the Topolje cliff and the water will leap from a hanging valley on to the floor of the Knin basin.

3. The Pliva Falls at Jajce, Bosnia.

The stage to which the Topolje Falls are approaching has been reached by the picturesque falls at Jajce, the ancient capital of Bosnia, where the river Pliva, which overflows from the Jezero Lakes, in one leap of about 80 feet jumps from a hanging valley into the Urbas river. The Pliva Falls have a more complex geological history than either of the falls on the Kerka.

The geology of the neighbourhood of Jajce has been described and mapped by Dr. Katzer,[1] and an earlier account was published by Mojsisovics.[2] The falls are described in many books on Bosnia, but I am not aware that the following interpretation of their formation has been previously suggested.

The district around Jajce is a dissected plateau. The rocks to the north-east are Mesozoic limestones, which have been faulted against the Carboniferous and Permian rocks of the hills to the south-west. The Urbas has cut its way by three deep canyons through the ridges left by the dissection of the plateau. Most of the tributaries of the Urbas have cut their beds down to its level. Thus the Krezluk, the first tributary above Jajce, and the Ugar, which is below the town, are at the base level of the main river. The Pliva, on the other hand, flows through a hanging valley, the end of which actually projects over the stream of the Urbas. The height of the falls is recorded in Baedeker's *Guide* as 100 feet. According to Asboth[3] it is 90 feet; but he also states that the cliffs beside the Urbas are 90 feet in height, and as the Pliva Falls discharge through a notch in these cliffs one of his two figures must be incorrect. The height of the falls is between 70 and 80 feet, but as the Urbas was in flood, several feet may be added at the end of the summer owing to the lower level of the main river.

The Pliva at the bridge a little above the falls is about 80 yards wide, but at the falls the river is divided by many tufa islets, and the main fall on the northern side of the river is about 25 yards wide.

The Urbas is narrower and deeper than its tributary; it flows through a canyon cut along the strike of some Oligocene marls. The Urbas is only 20 yards wide a little above the falls, and its powerful stream impinges against the foot of the waterfall. There is a deep recess at the foot of the falls which may be one of the caverns so common in the tufa, or may have been worn out by the Urbas along a softer bed when the river was at a slightly higher level. Fresh tufa is being formed upon the face of the cliff, but the Urbas prevents its further advance by

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[1] Fr. Katzer. *Geologischer Führer durch Bosnien und die Hercegovina.* IX Internat. Geol. Congr. Serajevo, 1903, pp. 157-192.

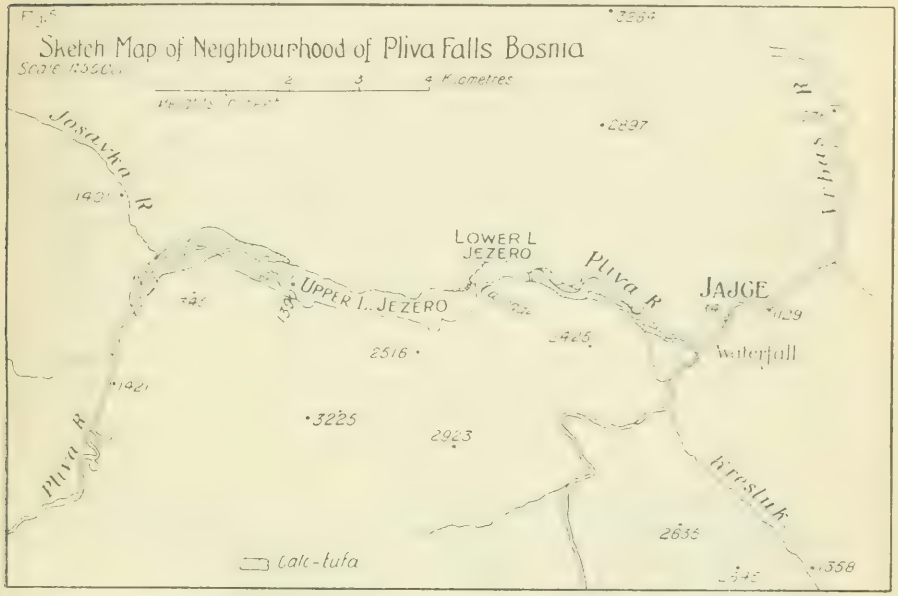
[2] E. von Mojsisovics. *Grundlinien der Geologie von Bosnien-Hercegovina.* Abh. k.k. geol. Reichs, 1880, vol. xxx. p. 225, 238-239.

[3] J. de Asboth. *An Official Tour through Bosnia and Herzegovina*, 1890, pp. 432-433.

constantly cutting away its base. Huge fallen blocks of tufa lie at the foot of the cliff.

The calcareous tufa of the falls is part of a mass which extends for nearly two miles along the valley of the Pliva. Its area is shown on Fig. 5 where it is inserted from Dr. Katzer's geological map. Its full thickness, according to Dr. Katzer, is 50-60 m. Most of the deposit is shown by two layers containing human remains to be pre-Neolithic. The lower of these layers is at the height of thirty-five metres above the level of the Urbas and at a few metres above the level of the Pliva. The upper bed is a few metres higher. Hence the uppermost 15 to 25 metres of the tufa were deposited in Neolithic and Post-Neolithic times.

Before the beginning of the deposition of the tufa the Pliva valley



was a gorge which, like the other rivers of the district, had been cut down to the base level of the Urbas; and the Pliva has since then filled up this gorge with calcareous tufa. The Pliva river was therefore dammed up, and the two Jezero lakes were formed; and at the same time the Pliva valley was converted into a hanging valley. After the tufa dam had been built to the height of from 50 to 60 metres above the Urbas, the Pliva has begun to excavate its bed and has cut a channel between the tufa crags on the north bank and the mound occupied by the Mohammedan cemetery on the south bank. The change from deposition to excavation is doubtless due to changes higher up the Pliva valley. This valley is crossed by three tufa barriers. The uppermost is at the western end of the Upper Jezero Lake; and extends along the main Pliva valley, but not along its tributary the Josavka. The floor of the upper Pliva therefore stands 20 feet higher than corresponding positions in the Josavka valley.

The second barrier divides the two Jezero lakes and forms the Upper Cascades of the Pliva.

The third tufa deposit is along the lower Pliva from near its outlet from the lower lake to its junction with the Urbas.

The Upper Lake Jezero is at the height of 1390 feet, the top of the Pliva Falls is at about 1210 feet, and the Urbas at the foot is at 1140 feet. The original summit of the tufa bar at the falls is about 1330 feet.

Before the formation of the two western tufa dams the lake in the Pliva valley would have been at the height of about 1330 feet. The level of this lake would have been gradually raised by the deposition of the tufa sheet along the course of the lower Pliva, until the lake stood at approximately the present level of the Lower Lake Jezero. The subsequent deposition of the second barrier then formed the Upper Jezero Lake, of which the water level is now at 1390 feet. Its surface is therefore about 60 feet higher than the top of the tufa barrier at the Pliva Falls. The raising in the level of the Jezero Lakes accordingly gave the Pliva a steeper slope and greater excavating power: and owing to this increase of its gradient, the Pliva has been able to cut its present channel through the old tufa bar. Thus the height of the falls has been lowered from about 120 to 70 feet. The raising of the level of the Jezero Lakes by the deposition of tufa barriers explains why the Pliva has in recent times partly cut through the barrier which it had previously built.

GEOGRAPHICAL NOTES

Europe.

Establishment of an Aërial Postal Service.—As a minor point of geographical interest, it is worth note that on Saturday, September 9, an aërial postal service was started between Hendon and Windsor, which is to be carried on daily, "weather permitting." The proceeds of the rather considerable postage are to be devoted to charity, so that the service cannot be said to be on a commercial basis, but its establishment is of interest in connection with the development of means of communication. Captain W. G. Windham, the most active mover in the present scheme, inaugurated the first aërial post in India last February.

Asia.

Recent Volcanic Eruption in the Philippines.—The *Bulletin* of the Geographical Society of Philadelphia for July last contains two interesting articles on Taal, the volcano in the island of Luzon which was the seat of a violent eruption at the beginning of the present year.

The Philippines contain several active volcanoes, the most important of which are Apo, Mayon, and Taal. Apo is in the southernmost part of

the Archipelago, and rises to a height of over 10,000 feet, making it the highest peak in the islands. Mayon is in southern Luzon, and is over 7000 feet in height. It is one of the most beautifully symmetrical volcanoes in the world. Taal, even prior to the present eruption, has been the seat of much disastrous activity, and presents some curious features.

The volcano is very low, the rim being not more than a thousand feet high, while the broad crater is practically at sea-level. The volcano is placed on an island within a lake some forty miles south of Manila. The island is almost entirely composed of the volcano, and despite the periodic activity of this, the fertility of the soil has always attracted a considerable population. The two papers mentioned describe the one a visit before and the other after the eruption. We may note the important items in the former description first.

The author, Mr. S. MacClintock, ascended to the rim of the crater and ultimately found his way down the steep interior to the vast amphi theatre within. On the floor two lakes were seen, both filled with liquid mud. In the smaller the water was continuously boiling, and giving off sulphureous and other gases.

The author of the second paper, Mr. C. A. Gilchrist, was at Manila at the end of January, and heard the tremendous noise of the explosion there, as well as seeing the huge vapour column, which ascended to a height of twenty to thirty thousand feet. Earthquake shocks had been felt on the preceding days, but after the main eruption activity rapidly subsided, and the whole eruption seemed to be limited to a period of about four days. On the day preceding the great eruption the lake water fell six or eight inches, and the island itself suffered a permanent subsidence of five or six feet, these movements being accompanied by violent wave action. The erupted matter consisted of mud, and destroyed a considerable amount of vegetation round the margin of the lake, but at a distance of sixteen miles there was nothing but a rain of warm mud. All the inhabitants of the island, together with many persons on the nearer, or western, shore of the lake, were killed, making a total death-rate of 1200 persons. When the author visited the volcano a few days after the eruption he found that vegetation had been annihilated over the greater part of the island, and a deposit of five to ten feet of mud had formed over its surface. The crater lakes within the rim had disappeared, and many boiling vents were visible over the old crater floor, though about half the area of the old crater had been unaffected by the eruption, except in so far as its floor had been covered with mud.

America.

The Galapagos Islands.—It is announced that the United States have purchased the Galapagos Islands from the republic of Ecuador. The islands, it will be remembered, lie off the coast of that republic, and have always been noted for their giant tortoises, and for the many peculiarities of the fauna, which was studied by Darwin during the voyage of the *Beagle*, and has been the object of many investigations

since. The object of the purchase is the fact that the islands command the Pacific entrance to the Panama Canal, as Cuba and Puerto Rico command its Atlantic entrance.

Australasia.

Expedition to British New Guinea.—It is announced that Mr. D. Jenness, of Balliol College, Oxford, is about to leave England on a scientific expedition in British New Guinea. The undertaking, which has been organised by the University, and the cost of which is being borne by private subscribers, will involve at least twelve months' work in the field. The objects are chiefly anthropological. From New Zealand Mr. Jenness will proceed to the extreme south-easterly corner of British New Guinea, to which region work will be confined. Headquarters will be on the Goodenough Island, the most northerly part of the Deutrecasteaux Archipelago. There it is intended to study the habits and customs, arts and religion of the inhabitants, who are thought to be an intermixture of the Melanesian and Papuan peoples. The district selected had been specially chosen as, although it is the most accessible portion of Papua for such an expedition, it remains absolutely untouched. Goodenough Island is volcanic, and has an area of thirty miles by forty. Its mountains rise to an altitude of eight thousand feet, and it is said to be the highest island of its size in the world. There is one mission station on the coast, and occasionally a Government official lands, but the interior has never been explored. It is known that cannibalism exists among the natives. Mr. Jenness expects to arrive on the island in November, and will then endeavour to enlist the services of natives to assist him in his work.

General.

Personal.—Colonel C. F. Close, C.M.G., R.E., has been appointed Director-General of the Ordnance Survey in succession to Colonel S. C. N. Grant, C.M.G., R.E.

Dr. F. Grant Ogilvie, formerly of Edinburgh, has been appointed by the President of the Board of Education, Director of the Science Museum. He will continue to fill also his present position of Secretary for the Science Museum and the Geological Survey and Museum.

Commercial Geography.

Harbour work at Lagos.—Owing to a dangerous and unstable bar at the entrance to Lagos Harbour, says the *Times*, caused by confusing cross seas, it has been impossible hitherto for ocean steamers to enter, with the consequence that the whole of the goods traffic, which increased from 154,000 tons in 1900 to more than 300,000 tons in 1910, has had to be discharged into surf boats outside the harbour, or carried on to the next harbour, Forcados, 130 miles to the east, where transhipment has been effected to coastal steamers, which have then conveyed the goods back to Lagos and have landed them inside the harbour. This

branch boat service has entailed an additional cost, variously estimated at between 5s. and 13s. a ton, in freight, and a considerable delay in the receipt of goods. It is surprising that this condition of affairs should have been allowed to exist for so long, and that the development of the harbour should have been undertaken with so much hesitation, for, as pointed out by Sir Walter Egerton, the *minimum* of 5s. per ton on, say, 240,000 tons is equal to £60,000 a year, equivalent to interest and other charges on a capital sum of £1,500,000, a portion of which might have been devoted usefully to the development of the harbour and thus to the removal of the cause of the excessive freight charges.

The harbour itself is situated at the mouth of an extensive system of lagoons, which, being navigable for a considerable distance by large canoes, offer exceptional facilities for inland transportation. The area of the harbour is about four square miles between the entrance and Carter Bridge, five miles inland, where the present terminus of the Lagos Government Railway is situated. It is expected ultimately to bring the rails alongside wharves to be constructed inside the harbour for the accommodation of ocean-going vessels, and thus to enable cargo to be discharged direct from the ocean steamer to railway waggons. In order to accomplish this and to render the channel navigable, a mole is being constructed on the eastern side of the entrance which will be 10,000 ft. long, and will project for about 7000 ft. beyond the present line of foreshore. Further mole works will be built on the opposite or western side of the entrance, and will serve to shelter the navigable channel from the effect of those agencies which have hitherto caused the formation of the bar.

The material for the eastern mole has been obtained from Abeokuta, sixty miles inland, where granite quarries, furnished with a mechanical rock-drilling plant, have been opened up.

The Lötschberg Tunnel.—M. Pierre Clerget discusses some points in connection with this tunnel in the *Revue Générale des Sciences* for August 15. The piercing of the tunnel was completed on March 31 last, and the whole route is expected to be opened in 1913. By road from Frutigen to Kandersteg, on the way to the north opening of the tunnel, the distance is about eight miles, but, as the gradient is on the average 3·3 per cent., it has been necessary to make the railway considerably longer, in order to diminish the gradient. This portion therefore measures about twelve miles, and traverses many tunnels and some twelve viaducts.

The tunnel as originally planned was to run in a straight line from Kandersteg to Goppenstein in the valley of the Lonza, but the disastrous accident in July 1908 made it necessary to curve it towards the north, and it now measures nine miles in length. The line is double, and passes beneath the Schafberg, the Gastern valley, and the Col of Lötschen. Springs have been frequently encountered, though less often than in the case of the Simplon, and the greatest obstacles have been the avalanches, which have produced a heavy accident rate. The highest temperature encountered was 93° F.

The southern slope of the new line extends from Goppenstein to Brigue, a distance of nineteen miles. The line descends the narrow valley of the Lonza by a cutting in the rock, and reaches the Rhone valley at Hohtenn, whence the north bank of the river is followed to Naters, and the river is subsequently crossed to reach Brigue. At this side, as on the north, tunnels and viaducts are numerous, no less than twenty-one tunnels being necessary.

From Spiez on Lake Thun to Brigue the trains will be worked by electricity.

EDUCATIONAL

Geographical Teaching in German Schools.—The German Association called the Geographentag has, according to the *Zeitschrift d. Gesellschaft f. Erdkunde zu Berlin*, been considering methods of reforming geographical teaching in the higher schools of Germany. The members of the association are of opinion that the present teaching does not allow sufficiently for the great strides which Germany has made of recent years, especially in trade and industry. They think that her future citizens should be so trained that they can appreciate the influence which geographical conditions have upon trade and national development, and may be fitted to face the great problems of the future. If the German colonies are to be developed as they ought to be, the German people must have a wider knowledge of geography than at present.

In order to promote these ends both general and detailed syllabuses are given, but these do not seem to contain anything particularly novel. It is, however, of interest to note the conclusions arrived at in regard to the training of the teachers. It is recommended that teachers of the subject should be specially trained, and should study geography during several years. Mere book work is regarded as insufficient, and excursions and practical work should form an essential part of the course. This practical work should be sufficient to render the teacher competent to lead similar excursions afterwards as part of the school work, and to instruct his class in simple methods of mapping, etc. As regards the interesting question as to the faculty with which geography is to be associated in the University, the resolutions of the Geographentag allow considerable latitude, but they recommend that the following should be optional subjects, with which geography may be associated for examination purposes:—(1) History, (2) Mathematics and Physics, (3) Geology and Biology. But they add that when geography is taken together with a literary subject such as history, the students should have strongly urged upon them the necessity for adding some practical study of geology to their course. "Without geological and climatological knowledge scarcely one branch of geography can be pursued with profit." The frequent association of history with Geography is regarded largely as a matter of school convenience, rather than as an indication of affinity between the two subjects.

The above is of interest as showing that the problems which confront geographical teaching in Germany are much the same as those we have before us here.

Local Time and Greenwich Time.—A recent note in *Nature* calls attention to the curious little fact that the city of Canterbury still maintains its own local time. The Dean and Chapter of the Cathedral have recently issued an intimation that the time observed in the cathedral is four and a half minutes ahead of Greenwich time. The post-office and railway clocks keep Greenwich time, and it is said that in a world where church-going has ceased to be one of the main preoccupations of life, the result is to introduce considerable confusion, for the town clocks oscillate between cathedral and railway time. The matter is noted here because of the fact that it might be usefully employed as an illustration in lessons on standard time.

NEW BOOKS.

EUROPE.

The Land of Burns: Mauchline Town and District. Written and Published by J. Taylor Gibb. Mauchline, 1911. *Price* 1*s.* 6*d. net.*

This little pamphlet, which is well illustrated by photographs, gives an interesting account of the town of Mauchline, with short notes on places in its vicinity. It has also a chapter on the geology of the district by Mr. Tyrrell of Glasgow University.

Tátra-Album. Les Chemins de Fer Kassa-Oderberg et la Haute-Tátra. Avec 7 tableaux coloriés et vingt-six gravures sur bois d'après les aquarelles de E. L. Compton. Budapest: Joseph Edouard Rigler, Société Anonyme, 1911.

The Carpathians are but little visited by British tourists, though from the plates in this atlas it would seem that their scenery rivals that of the Alps. The text of the album is in German, French, and Italian, and its object is apparently to attract visitors to the High Tatra region, the chief excursions in which are described. There is a map in addition to the fine series of coloured plates, and the album may be recommended to the notice of those in search of new holiday resorts.

Handbook to Norway. London: Ward, Lock and Co. *Price* 2*s.* 6*d.*

This is a useful little guide, handy and compact in form, moderate in price, and furnished with a large number of maps and illustrations. It gives a comprehensive account of the attractions of Norway from the tourist's standpoint, including winter sports, and even tours to Spitsbergen.

A Nook in Galloway. By Thomas Newbigging. Gatehouse-of-Fleet: J. R. and A. Kirkpatrick, 1911. *Price* 2*s. net.*

The "nook" is the small area which extends from Gatehouse-of-Fleet to Creetown along the shores of Fleet Bay and Wigton Bay, and the author gives a most eloquent description of its charms, including both the natural beauties and the

historical and legendary associations which cluster around the district and its buildings. There are a number of illustrations.

Europe in Pictures. By H. Clive Barnard, M.A. London : Adam and Charles Black, 1911. *Price* 1*s.* 6*d.*

This is another number of Black's Pictorial Geographies, and is illustrated by a very fine series of pictures, both coloured and uncoloured. Many are very well reproduced, and the subjects chosen are likely to stimulate the imagination, while the plates are well annotated. We think that the children to whom this book is given are singularly fortunate, and should early acquire a taste for geography. The text gives a summary but accurate enough account of the countries of Continental Europe. It is, however, much condensed, and will require a good deal of explanation by the teacher.

Mediæval Europe. By H. W. C. Davis, M.A. Home University Library. London : Williams and Norgate. *Price* 1*s. net.*

This interesting little book is naturally more concerned with history than with geography, but incidentally it throws a good deal of light on geographical questions. We have read with especial interest the chapter on the Free Towns, which suggests many points with regard to the origin of towns, a subject with which geography has been greatly concerned of late years. The book is illustrated by several sketch-maps, but unfortunately some of these are so much reduced as to be hardly intelligible, and none of them can be said to be very clear.

The Alpine Guide. The Central Alps, Part II. (including those Alpine portions of Switzerland, Italy and Austria which lie South and East of the Rhone and Rhine, South of the Arlberg and West of the Adige). By the late John Ball, F.R.S., etc. A new edition, reconstructed and revised on behalf of the Alpine Club under the general Editorship of George Brooke. London : Longmans, Green and Company, 1911. *Price* 7*s.* 6*d. net.*

The great advantage of a climber's *Guide* is that, to its public, mountains present no obstacle, and therefore the country described is considered in natural regions, and the unhappy tourist is not left suspended on the top of a pass, where the ordinary guide-book merely affords him the cold comfort that, as he has now crossed a political frontier, he must seek further information in another volume. As this other volume is usually with his luggage, and the luggage is in the custom house, the information rarely affords him much satisfaction. In Ball's *Guides* matters are different, and the mountaineer can cross and recross the frontier without fear of being forsaken at critical points.

The present volume is not, however, wholly confined to mountain regions. It includes a consideration of the lakes Como and Maggiore, the description of the former lake being especially interesting. The Engadine is also very fully described, though nowadays it can hardly be regarded as primarily a mountaineer's resort.

In addition to a general uncoloured map of the region discussed, which forms the frontispiece to the volume, there are nine coloured maps, supplied by Ravenstein of Frankfurt, which give most admirable representations of the topography of the region. We strongly recommend this new edition to the notice of those interested in the Alps.

The Kent Coast. By Arthur D. Lewis. County Coast Series. London: T. Fisher Unwin, 1911. *Price* 6*s. net.*

Mr. Lewis says he went all round the coast of Kent on foot. His readers will find that this volume amply repays his labour by its interesting descriptions. Beginning at Rochester, he recalls Charles Dickens's residence there, and at Gad's Hill where he died. He might have mentioned Dean Hole, the celebrated Rosarian of Rochester. Faversham lives in the anonymous play *Arden of Faversham*, which Swinburne attributed to Shakespeare. At Birchington died Dante Gabriel Rossetti, after finishing the ballad "Jan van Hunks." Charles Lamb's essay on the "Old Margate Hoy" is a record of his visits to Margate. Then at Broadstairs we find numerous houses where Charles Dickens once lived, until "vagrant music" disturbed his quiet and drove him away. Ramsgate is associated with Sir Moses Montefiore, and also with Heine, who stayed a fortnight there enjoying "the lovely wide sea whose waves clamber up the rocks and roar their most joyous music for my heart." Ebbsfleet is celebrated as the place where Hengist and Horsa and also St. Augustine landed. "Canute when he left England put ashore the English hostages at Sandwich, having first deprived them of their hands, ears and noses." He afterwards gave the port of Sandwich to Christ Church, Canterbury.

Queen Elizabeth and retinue made in 1572 a splendid entrance into Sandwich, and at a banquet there "she was very merry." In 1578 "a most fierce and terrible earthquake" occurred there. Proceeding to Walmer Castle we find it occupied by such famous wardens of the Cinque Ports as William Pitt, and the Duke of Wellington who died there. Julius Caesar is believed to have landed about Deal, where G. P. R. James wrote his tale of the smugglers, a flourishing trade at one time. Dover was surrounded with walls by Severus about 200, and in 1189, Richard Cœur de Lion, sailed from Dover for the Holy Land. The Emperor Charles v. landed here both in 1520 and 1522, while Charles II. landed at Dover when invited to occupy the British throne. Wordsworth wrote Sonnets near Dover, a place famous for Captain Webb's swim from there to Calais in 1875, and Blériot's arrival from Calais on an aeroplane in 1909. Folkestone is celebrated as the birthplace of William Harvey, the discoverer of the circulation of the blood. The coast from Folkestone to Romney is styled by the author the "H. G. Wells coast," as that novelist has described it so fully, especially in *Kipps*. But few novels can excel Mr. Lewis's own book in interest and variety.

ASIA.

Among the Tribes in South-West China. By Samuel R. Clarke, thirty-three years a missionary in China. London: Morgan and Scott. *Price* 3*s.* 6*d.*

The tribes referred to in the title of Mr. Clarke's book are the non-Chinese races who inhabit the province of Kweichou, and are known to the Chinese as the Miao, or Miao-tse; the latter name being the less respectful of the two. These people claim to be the aborigines of the country. There is probably some right behind this claim: but, until within the last few years, little has been known about these interesting peoples. Now that the members of the China Inland Mission have established their stations among them, more information will be forthcoming, and Mr. Clarke's book may be taken as a first instalment. It is in two sections, the first being ethnological, while the second part deals with the work of the Protestant missionaries. The former section will probably be of most

interest to the general reader. Mr. Clarke divides the people into separate tribes or races distinguished as the Black Miao; the Hua, or flowery, Miao; the Keh Lao; the Chung-Chia, or Shan, tribes; and the Lo-Lo, or No-Su. The notes on the customs of the various tribes are minute, and throw an interesting light on the social life of these little-known peoples. The author is not able to trace anything in the shape of definite religious beliefs among them; that is to say, they are neither Buddhists nor Tauists like the Chinese among whom they live. Rather they are Animists, to whom the world is full of immaterial powers and intelligences, and the nearest thing to religious rites practised by them are those which have for their purpose the exorcising of demons. But they also have their ideas of a cosmogony which are expressed in a species of metrical chant, or song, in which the story of the creation of animate and inanimate nature is told by means of strophe and antistrophe. Such songs are their only records, as they do not practise the art of writing. Mr. Clarke gives his own translations of some of these sagas which seem to be spirited. The translations are reminiscent of Hiawatha. Lists of words are given in an appendix, which may enable the comparative philologist to form some idea of the languages spoken by the Miao and other non-Chinese tribes of Kweichou.

The photographs with which the text is illustrated strike us as being unusually good, and the book forms a valuable contribution to the very slender records which exist dealing with the tribes of south-west China.

AFRICA.

An Englishwoman's Twenty-five Years in Tropical Africa. Being the biography of Gwen Elen Lewis, Missionary to the Cameroons and the Congo. With Illustrations and Map. London: Hodder and Stoughton, 1911. *Price* 6*s.*

Mrs. Lewis (then Miss Thomas) went to the Cameroons in 1884, on behalf of the Baptist Missionary Society, and after a year or two there, when the country had been annexed by Germany, she began the twenty-three years of faithful service in the Congo region which terminated with her death. The geographical interest of the book is secondary, but there are vivid details of her experiences at the mission stations and on her journeys.

The Geology and Geography of Northern Nigeria. By J. D. Falconer, M.A., D.Sc. London: Macmillan and Co., Ltd. *Price* 10*s. net.*

In this volume the author sums up some of the more important results of his labours in connection with the Mineral Survey of Northern Nigeria, which was instituted by the Colonial Office in 1904. It may be said at once that the work forms a very valuable contribution to our knowledge of some aspects of the great Protectorate, and offers some very suggestive ideas upon several much discussed questions of morphology.

The greater part of the book is devoted to the stratigraphical geology of the country, and therefore calls for no notice in these pages. One might have been justified in expecting some adequate treatment of the economic geology, its bearing upon the activities of the people and the development of the country, but since these questions have been fully dealt with in the official reports of the survey, the author has been content to give a very brief summary of the mineral resources in an appendix to his work, and to refer his readers to the detailed reports of Professor Dunstan. But the first and parts of the last three chapters of the book contain much that is of interest to the student of physical geography, for in spite of the comprehensive title of the volume it is that aspect of geography alone with which the author is here concerned.

In the first sixty pages we get a very detailed account of the topography of the country. In his description the author has confined himself almost entirely to the empirical method, but such a treatment was inevitable, for even yet sufficient data are not available to justify the use of the explanatory method. Although the author has eschewed the "coloured" style in his writing, and although he handles a great mass of details, the result of his own and his colleagues' patient observation and study during several years, yet he has succeeded in giving a very succinct and graphic account of the topography of the country, which is rendered all the more interesting by the map which he has compiled. His description of the Niger valley is perhaps one of the most successful examples of his method. Not only is the author a very careful and shrewd observer; the latter chapters of his work prove that he can also utilise his observations to construct some very suggestive and original theories. For example, Dr. Falconer has come to the conclusion that many of the dominant features of the country to-day can most easily be accounted for by assuming that within comparatively recent times an area of low relief has been subjected to a period of depression, then to a period of elevation and maximum erosion, succeeded by another period of depression, and finally to a second period of elevation. Accompanying these crustal movements there has been an alternation of humid and arid conditions which, he thinks, besides accounting for several of the present topographic features, may also explain the distribution of the ironstone capping to be found over considerable areas of the plains of Hausaland. In applying his theory the author is led to disagree with Dr. Passarge when he suggests that the Vere Hills are an instance of the horst structure, and, as Suess seems to infer, a continuation of the Kamerun line. Dr. Falconer holds that these hills are not the result of marginal faulting but have been produced by normal processes in successive periods of erosion and accumulation.

In the author's opinion the advent of desert conditions, and the consequent formation of a line of sand dunes, which can still be traced from Kukawa to the river Yo, played an important part in forming Lake Chad as we now know it. He regards this sheet of water not as a relic of an early Tertiary Sea, but as a remnant of a great swamp-land which covered this area in late Tertiary times, to which the Bahr el Ghazal formed an outlet towards the East.

Perhaps the most suggestive and original part of the book is the author's attempt to reconstruct the more recent changes in the drainage lines of the country. It would appear that the last period of elevation was also accompanied by a gentle folding of the crust, which has given rise to two series of arches which the author has been able to trace across the country, the one in a north-west to south-east direction and the other north-east to south-west; and it is the relation established between these two sets of folds that has determined the main outlines of the present hydrographical system. He also suggests the existence of earlier river valleys in place of the Upper Benue, the Lower Gongola, and the Lower Niger, and is inclined to support Dr. Passarge's argument for the youthful stage of the African rivers. Throughout the book the author maintains a strictly independent point of view, and does not hesitate to drive his theories to their logical conclusion, but he readily acknowledges that additional research may fail to confirm some of his positions. Meanwhile we are grateful for this volume, not only for its own sake, but also because it so worthily maintains the traditions of Scottish geology. It is to be hoped that the author will employ the unique opportunities he has had of studying the country to give us as interesting and suggestive a volume on those aspects of geography which the present book necessarily leaves untouched.

AMERICA.

Nova Scotia. By Beckles Willson. London: Constable and Co., Ltd., 1911. *Price* 10*s.* 6*d. net.*

Nova Scotia is admittedly the Cinderella of the dominions across the Atlantic, and the least known of our American colonies. Mr. Beckles Willson is evidently of opinion that this obscurity is undeserved, and this volume seems to have been written with the intention of enlightening the people of Great Britain as to the conditions, resources, beauties, prospects, etc., of a tract of country which, he thinks, deserves more attention than it has hitherto received. For this laudable purpose, after a brief sketch of its history, he takes his readers what may be called a tour through the subdivisions of the province, touching lightly and pleasantly on the salient features of the principal lakes, cities, industries, etc., and enhancing the interest of his subject by occasional historical and biographical references and narratives, and by descriptions of industries, sport, etc. It has to be confessed that at times the work comes perilously near to becoming a glorified Baedeker or Murray; as when we read that "there is good bathing at St. Peter's, and as a matter of course there is every facility for boating, both in the bay and in the inlet at the other end of the canal. Excellent trouting may be had by going a short distance. . . . St. Peter's may also be reached from Point Tupper on the opposite side of the Strait of Causo, by taking the Cape Breton Railway, a journey of thirty-one miles." The author, however, does not claim for his work that it is exhaustive; and if his object is, as we have said, to arouse interest in Nova Scotia and to call attention to its present condition and resources, with a view to diverting to it, to some extent at least, the stream of emigrants from Europe, then his effort may be successful. We must add that the volume is illustrated by a large number of good photographs and is equipped with a useful map.

AUSTRALASIA.

Papua: Its History, Inhabitants, Physical Features, etc. By W. C. Pritchard, With Appendix on Health Conditions by Dr. R. F. Jones. London: Society for Promoting Christian Knowledge, 1911. *Price* 1*s.* 6*d.*

This book is based upon government and other publications relating to New Guinea, its author having been for nearly a year attached to the Anglican Mission Staff in that island. The proceeds are to be devoted to the funds of the Mission, and the book is addressed chiefly to those interested in the settlement of the island. While not professing to contain anything novel, it will prove useful to those desirous of obtaining a concise account of Papua.

GENERAL.

Characteristics of Existing Glaciers. By William Herbert Hobbs, Professor of Geology in the University of Michigan. New York: The Macmillan Company, 1911. *Price* 13s. 6d. *net.*

Professor Hobbs believes that in the scientific study of glaciers the small Alpine forms have been too exclusively regarded as types, and the great contrasts which exist between them and the ice masses of Polar regions have in consequence been very inadequately treated. He is of opinion that the contrasts between these two types are so great that they cannot be justly considered together. He distinguishes therefore two main classes of glaciers:—(1) the mountain glaciers which occupy but a small portion of the surface on which they lie, and (2) the inland-ice or continental glaciers, which have the form of a flat dome or shield, and cover completely a large area of rock surface. In the former case the glacier cannot be said to have any characteristic form, for it follows the modelling of the

surface on which it lies. In the latter case the irregularities of the supporting base are too small in relation to the mass of ice to affect the form of the mass, which, as stated, is characteristically dome-shaped, the dome sometimes, as in the Antarctic region, being extended into a marginal terrace of what the author calls shelf-ice, as being more descriptive than the term ice-barrier, so commonly used by Antarctic explorers. Between the two classes the small ice-caps of Norway and Iceland form to some extent a transition, for while they resemble mountain glaciers in their position high above sea-level, they resemble continental ones in their shape and in the way they cover the surface completely. Apart from shape a further great contrast between the two classes is that while in the case of mountain glaciers rock surfaces are always exposed above the highest point of the glacier, no such rock protrudes above the higher levels of the continental glacier, the characteristic "nunataks" being limited to the margin, *i.e.* to the lower levels.

No essential point of difference between Arctic and Antarctic glaciers is discernible, but the fact that the latter reach greater dimensions, and not only cover, or tend to cover, the whole land surface, but also extend outwards to the sea in ice-shelves, while the smaller Arctic ice-caps leave a ring of free land round their margins, make it convenient to consider the two types separately. The book is therefore divided into three parts:—(1) Mountain glaciers, (2) Arctic glaciers, and (3) Antarctic glaciers.

In the first part the most novel point, and that which is most stressed, is the origin of the cirque, and the effect of its progressive development in modifying the relief of the rock surfaces which lie above the glaciers. While the continuous ice-cap tends to smooth away irregularities, the author believes that the cirques which form at the heads of mountain glaciers tend to accentuate the surface relief, and to produce a more rugged topography than any other erosional process. Thus mountain glaciers carve and "fret" their uplands into peaks, needles and ridges; continental glaciers smooth them.

The first origin of cirques is, he believes, to be sought in "nivation," that is in excessive frost-work about the receding margins of snow drifts in summer time. Once formed, the wall of the cirque tends, he believes, to retreat steadily backward by basal sapping at the base of the *bergschrund*.

The remainder of the section on mountain glaciers follows more or less the usual lines, but the two following parts will be found especially interesting because the author collects together and summarises the rich mass of material which recent expeditions have brought back, and draws from this material some interesting conclusions. Space does not permit us here to attempt the task of stating these conclusions. All that we can do is to quote a few words giving the author's views as to the difference in the "alimentation" of the two great classes of glaciers: "Mountain glaciers are nourished by moisture-laden *surface* currents of air, which, encountering an upland area, are forced to rise, and are thereby cooled adiabatically and by contact with the upland, so that their burden is deposited in the form of snow. Inland-ice, on the contrary, if we neglect for the moment the marginal terrace sometimes present, appears to be regularly fed from high-level currents, through the operation of a refrigerating air engine of which the ice mass and its atmospheric cover are the essential parts."

The book is very copiously illustrated, and some of the illustrations and diagrams are very fine. We note especially, as being most suggestive of the contrast between Alpine and Antarctic glaciers, the sketch-map of the Beardmore Glacier with the Great Aletsch Glacier drawn to the same scale.

We cordially recommend the book to the notice of those interested in the much-discussed subject with which it deals. As we have already stated, the parts

relating to the glaciers of Polar regions condense a great deal of information which would otherwise require to be sought in separate monographs, and in that dealing with mountain glaciers the descriptions and figures of North American glaciers will prove very valuable to those who have a practical acquaintance only with Alpine forms.

How to use Contour Handmaps for Class Teaching. Suggestions for Practical Exercises. With Coloured Facsimile. By J. A. White, Headmaster, Alton Street L.C.C. School. London: George Philip & Son, Ltd. *Price* 6*d.*

This small pamphlet is intended to accompany the "Improved Visual Contour Outline Maps," reviewed here on p. 504. It is rather carelessly written, though the suggestions seem sound enough so far as they go. We think that the price is somewhat high in view of the fact that advertisement of the other publications of the firm plays a considerable part in the text. We note that the same atlas is twice recommended in the course of seven pages, and is also advertised on the cover.

BOOKS RECEIVED.

The Story of Korea. By Joseph H. Longford, late H.M. Consul at Nagasaki, Professor of Japanese, King's College, London. With 33 Illustrations and 3 Maps. Demy 8vo. Pp. 430. *Price* 10*s.* 6*d. net.* London: T. Fisher Unwin, 1911.

"*Yakusu,*" *The Very Heart of Africa: Being some account of the Protestant Mission at Stanley Falls, Upper Congo.* By H. Sutton Smith. Demy 8vo. Pp. xx + 288. *Price* 6*s. net.* London: Marshall Brothers, 1911.

The Kachâris. By the late Rev. Sidney Endle. With an Introduction by J. D. Anderson, I.C.S. Demy 8vo. Pp. xx + 128. *Price* 8*s.* 6*d. net.* London: Macmillan and Co., 1911.

Mexico: A General Sketch. Compiled by the Pan-American Union. John Barrett, Director-General. Demy 8vo. Pp. 390 + xvii. Washington, 1911.

Early Spanish Voyages to the Strait of Magellan. Translated and Edited with a Preface, Introduction, and Notes, by Sir Clements Markham, K.C.B. Demy 8vo. Pp. xii + 288. London: Hakluyt Society, 1911.

Off the Main Track. By Stanley Portal Hyatt. Illustrated. Demy 8vo. Pp. vii + 293. *Price* 12*s.* 6*d. net.* London: T. Werner Laurie, 1911.

The Mediterranean. Book iv. (The Junior Scientific Geography). By Ellis W. Heaton, B.Sc., F.G.S. Cr. 8vo. Pp. 111. *Price* 1*s. net.* London: Ralph Holland and Co., 1911.

Rambles in the Black Forest. By J. A. R. Wylie. With 5 Illustrations in Colour and 22 from Photographs. Demy 8vo. Pp. 325. *Price* 6*s.* London: Mills and Boon, 1911.

Rambles around French Châteaux. By Francis M. Gostling. With 5 Illustrations in Colour and 33 from Photographs. Demy 8vo. Pp. xiv + 366. *Price* 6*s.* London: Mills and Boon, 1911.

British Plants: Their Biology and Geology. By J. F. Bevis, B.A., B.Sc., and H. J. Jeffrey, A.R.C.Sc., F.L.S. Demy 8vo. Pp. xii + 334. *Price* 4*s.* 6*d. net.* London: Alston Rivers, 1911.

Weather Science: An Elementary Introduction to Meteorology. By F. W. Henkel, B.A., Member of the British Astronomical Association. Demy 8vo. Pp. 336. *Price* 6*s. net.* London: T. Fisher Unwin, 1911.

Nooks and Corners of Cornwall. By C. A. Dawson Scott. With a Map. 12mo. Pp. xviii + 215. *Price* 2*s.* 6*d. net.* London: Eveleigh Nash, 1911.

Romantic Edinburgh. By JOHN GEDDIE. With 8 Coloured and 41 Black and White Illustrations. Second Edition. Revised. Cr. 8vo. Pp. xi + 299. *Price* 5*s. net.* London: Sands and Co., 1911.

The Chinese at Home, or the Man of Tong and his Land. By J. DYER BALL, I.S.O., M.R.A.S. Demy 8vo. Pp. xii + 369. *Price* 5*s. net.* London: The Religious Tract Society, 1911.

The Suk: Their Language and Folklore. By MERVYN W. H. BEECH. With Introduction by Sir CHARLES ELIOT. Demy 8vo. Pp. xxiv + 149. *Price* 12*s.* 6*d. net.* Oxford: Clarendon Press, 1911.

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A Guide to Zermatt and the Matterhorn. By EDWARD WHYMPER. With 79 Illustrations and Maps. Cr. 8vo. Pp. xiv + 224. *Price* 3*s. net.*

A Guide to Chamonix and the Range of Mont Blanc. By EDWARD WHYMPER. With Illustrations and Maps. Cr. 8vo. Pp. xiv + 206. *Price* 3*s. net.* London: John Murray, 1911. Presented by Edward Whymper.

Commercial Geography. By ALBERT PERRY BRIGHAM. Demy 8vo. Pp. xvi + 469. *Price* 6*s.* New York: Ginn and Co, 1911.

The Glaciation of East Lothian South of the Garleton Hills. By Professor P. F. KENDALL and Mr. E. B. BAILEY. 4to. Pp. 31. *Price* 4*s.* 6*d.* Presented by the Royal Society of Edinburgh.

The History of the Castle of York, from its Foundation to the Present day, with an account of the building of Clifford's Tower. By T. P. COOPER. Demy 8vo. Pp. xx + 379. *Price* 12*s.* 6*d. net.* London: Elliot Stock, 1911.

The Wonderful Weald and the Quest of the Crock of Gold. By ARTHUR BECKETT. Demy 8vo. Pp. xvi + 444. *Price* 10*s.* 6*d. net.* London: Mills and Boon, 1911.

Bibliotheca Geographica Jahresbibliographie der Gesamten Geographischen Literatur. Bearbeitet. Von OTTO BASCHIN. Band xvi. Jahrgang, 1907. Demy 8vo. Pp. xvi. + 522. Berlin: W. H. Kühl, 1911.

The Surgeon's Log: Being Impressions of the Far East. By J. JOHNSTON ABRAHAM. With 44 Illustrations. Demy 8vo. Pp. xii + 538. *Price* 7*s.* 6*d. net.* London: Chapman and Hall, 1911.

On the Wallaby through Victoria. By E. M. CLOWES. Illustrated. Cr. 8vo. Pp. xi + 308. *Price* 6*s. net.* London: William Heinemann, 1911.

Also the following Reports, etc.:—

Official Year-Book of the Commonwealth of Australia, 1901-1910. No. 4, 1911. By G. H. KNIBBS, C.M.G. Melbourne, 1911.

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Rainfall of India: Twentieth Year, 1910. Calcutta, 1911.

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Annual Statement of the Trade of the United Kingdom with Foreign Countries and British Possessions, 1910. Vol. II. *Price* 3*s.* 3*d.* London, 1911.

First Report and Inventory of Monuments and Constructions in the County of Berwick. Price 6*d.* Edinburgh, 1911.

Second Report and Inventory of Monuments and Constructions in the County of Sutherland. Price 6*s.* Edinburgh, 1911.

Colonial Reports (*Miscellaneous*).—Report on the Administration of the Roads and Land Settlement Fund of St. Vincent (77).

Colonial Reports (*Annual*).—Report for Turks and Caicos Islands, 1910 (681); Report for Falkland Islands, 1910 (682); Report for Northern Territories of the Gold Coast, 1910 (683); Report for Bahamas, 1910 (684).

Diplomatic and Consular Reports.—Trade of Uruguay, 1910 (4709); Trade of Portuguese Possessions in East Africa, 1910 (4710); Trade of Rome, 1910 (4712); Trade of Iceland and the Färöe Islands, 1910 (4715); Trade of Zanzibar, 1909-10 (4716); Trade of the Grand Duchy of Baden, 1910 (4718); Trade of Wuchow, 1910 (4719); Trade of the District of Alexandria, 1910 (4726); Trade of the District of Marseilles, 1910 (4727); Trade of Port of Spezia, 1910 (4728); Trade of Canton, 1910 (4729); Trade of Basra, 1910 (4730); Trade, etc., of Thessaly, 1910 (4731); Trade, etc., of District of Galveston, 1910 (4732); Trade of Pomerania, 1910 (4733); Trade of Erzeroum, 1910 (4734); Trade of Kiungchow, 1910 (4735); Trade of Katanga, 1910 (4736); Trade of Sicily, 1910 (4737); Trade of Santa Marta, 1910 (4738); Trade of Bolivia, 1910 (4739); Trade of Trebizond Vilayet, 1909-10 (4740); Trade of Aleppo Vilayet, 1910 (4741); Trade of Mexico, 1910 (4743); Trade of Newchwang, 1910 (4743); Trade of the Consular District of Iquique 1910 (4744); Trade, etc., of French West Africa, 1910 (4745); Trade, etc., of Beirut and the Coast of Syria, 1910 (4746); Trade of Shanghai, 1910 (4747); Trade, etc., of Portland, etc., 1910 (4748); Industries and Commerce of Spain, 1910 (4749); Trade and Agriculture of the Piraeus and District, 1910 (4750); Trade of China, 1910 (4751); Trade and Commerce of the Consular District of Chiengmai, 1910 (4752); Trade of Mengtsz and Ssumao, 1910 (4753); Trade and Commerce of Florence, 1910 (4754); Trade and Agriculture of the Consular District of Chicago, 1910 (4755); Trade of Samoa, 1910 (4756); Trade of Lombardy, 1910 (4757); Trade of Venezuela and the Consular District of Caracas, 1909-10 (4758); Trade of Abyssinia, 1910 (4759); Trade, etc., of New York, New Jersey, etc., 1910 (4760); Trade of Changsha, 1910 (4761); Trade of Chile, 1910 (4762); Foreign Trade of the Port of Santos, 1910 (4763); Finances of Servia, 1911 (4764); Finances of Austria-Hungary, 1910-11 (4765); Trade of Kermanshah, 1911 (4766); Trade and Commerce of Port Said and Suez, 1910 (4767); Trade of Japan, 1910 (4768); Trade of the Island of Formosa, 1910 (4769).

Also the following Pamphlets, etc.:—

The Nature of Volcanic Action. By Reginald A. Daly. With 5 Plates. Pp. 122. Boston, 1911. Presented by the Author.

The Battle of Dunblane Revised (*Sherriffmuir*, 1715). By John E. Shearer, F.S.A. Scot. Pp. 28. *Price* 6*d. net.* Stirling: R. S. Shearer and Son, 1911.

Rhodesia Museum, Bulawayo: Ethnological Section. Part I. To which is added the *Bushman Paintings.* By R. N. Hall. Bulawayo, 1911. Presented by the Author.

Indentured Labour in Tropical Colonies. By Lieut.-Colonel J. A. Wylie, F.R.G.S. Pp. 50. Edinburgh: Oliphant, Anderson and Ferrier, 1911. Presented by the Author.

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THE SCOTTISH GEOGRAPHICAL MAGAZINE.

SOME RECENT CONTRIBUTIONS TO GEOGRAPHY.[1]

By Geo. G. Chisholm, M.A., B.Sc.,
Lecturer on Geography, Edinburgh University.

(*With Plate.*)

The first of the recent contributions to the subject of geography to which I wish to direct your attention is the latest, the address delivered by Colonel C. F. Close, C.M.G., R.E., to the Geographical Section of the British Association, as president of the section, at its meeting at Portsmouth at the end of August this year.[2] It is a remarkable address, coming as it does from one occupying a presidential chair in a body devoted to the study of geography. For, after asking, as so many have done before him, the meaning and object of geography, and adopting a method of his own to arrive at the answer to that question, he comes to the conclusion that a geographer who has not made a special study of one or more of such subjects as geodesy, surveying, cartography, geology, climatology, or ethnography can do much to popularise these subjects but cannot hope to do original work.

I need hardly say that this is a conclusion with which I do not agree, and I think that the answer to this contention may to some extent be read between the lines of observations made by Colonel Close himself. He remarks, "I shall very probably be told that, in laying some stress on the above-mentioned aspects of the subject, I have forgotten that the main purpose of geography is the study of the earth as the home of man, or the study of man as affected by his environment, and that, however necessary it may be to begin with a foundation of geodesy, geology, and climatology, we must have as our main structure the investigation of the

[1] Opening Lecture of the Session 1911-12, delivered to the Geography Class, Edinburgh University, October 11, 1911.

[2] See *Scottish Geographical Magazine*, 1911, pp. 505-16.

effect of place conditions on the races of man, on human history and human industry, on economics and politics."

Now if we only change "the effect of place conditions" into "effects connected with place conditions," this sentence does in fact include a statement of what I believe nearly all geographers would be agreed in telling him. It contains, indeed, somewhat more than that, and perhaps somewhat more than Colonel Close meant to say. When he suggests as an expression of the main purpose of geography "the study of man as affected by his environment," he makes the scope of geography too wide. The air we breathe is a very important part of the environment of man, but the study of the mere physiological effects of air as such, apart from local differences in the composition of the air, is no part of the task of the geographer. This, however, is practically a trifling and indeed merely formal correction, inasmuch as the local differences in the air we breathe are important, and these do come within the range of the geographer's consideration.

I have to mention further that Colonel Close is willing to concede, at least conditionally, some force to this claim as to the main structure in geography. That is why I have said that an answer to his contention above stated may to some extent be read between the lines of his own observations. I propose afterwards to consider the gingerly fashion in which he makes this admission, but meantime I want to note the fact that it is to some extent made, and to consider the effect of that admission on the mode he has adopted for arriving at an idea of the scope of geography.

I have indicated a change in wording with reference to the claim put forth as to the main structure of geography. My reason is that, as stated in my opening lecture in 1908, no effects of place can be pointed out except in virtue of facts that are not connected with place. To take the simplest illustration, if one speaks of the influence of mountainous country in impeding transport and communication, that assumes the fact that in going up hill one has to contend against gravity, a fact belonging to the realm of physics. Consideration shows that influences connected with place are modified in a great variety of ways which can be understood only by making oneself more or less acquainted with facts belonging to many sciences. If, for example, it is recognised that one effect of the substitution of perennial for basin irrigation in Egypt is to deprive the Egyptian fields of fertilising silt, it obviously becomes an important geographical problem to inquire how, placed as Egypt is, the lack of that fertilising agent may best be made good. Obviously this involves a knowledge of chemistry and vegetable physiology and investigations under both these heads, as well as knowledge of the mechanism of trade, but in so far as the ultimate aim of the inquiry is the determination of place values the inquiry is geographical.

Bearing that in mind, let us now consider how Colonel Close has endeavoured to ascertain the field of geography. Taking the *Geographical Journal* as indicating the matter with which geography deals, he has analysed the original contributions in that publication during the five years 1906 to 1910. He finds that 57 per cent. of these give the

results of explorations, and the remaining 43 per cent. may be referred to general physical geography, economic and social geography, hydrography, meteorology, and climatology, and other sciences and branches of study, leaving nothing over for geography as such.

But see what is involved in this procedure. He assumes that accounts of exploration, being mere description, have nothing of the nature of science in them. But all description involves selection, and the selection of the points you emphasise, the endeavour to place all the facts in your description in due relation to one another, depends on the aim you have in view, and if that aim is to bring into prominence influences on man connected with place and to attach to each their due weight, then the description becomes a truly scientific geographical description from the point of view of geography recognised by Colonel Close as at least a possible one. If mere description is to be excluded from the work of science, what becomes of geology, zoology, botany, and other sciences in which description with a distinct aim is a necessary foundation?

And with regard to the remaining 43 per cent. of the subjects dealt with in the last five years in the *Geographical Journal*, if we once recognise the great variety of ways in which place values are modified, we cannot but discern the necessity under which the geographer lies, while still keeping his own aim distinctly in view, for taking up inquiries now connected with one branch, now with another branch of science. Surely Colonel Close would never contend that the different sciences can be conceived as existing in air-tight compartments, having no connection one with the other. He tells us that a map showing the distribution of plants will be better interpreted by a botanist than by a person ignorant of botany. We are not called upon to question that. We may admit that to construct such a map one must be a botanist, but we have none the less to add that the botanist who constructs such a map must be also a geographer. He has to inquire into the nature of local facilities for and barriers to dispersion, and to that extent he is making geographical inquiries, and it may be added that he will find he is dealing to a large extent with the same considerations as have the most prominent place in human geography, physical features and climate.

I have referred above to the gingerly fashion in which human geography is recognised by Colonel Close as at least a possible field for scientific geography. What he says is this: "Before this human aspect of geography—or, for that matter, any other aspect of the subject—is recognised by the world of science as an independent, indispensable, and definite branch of knowledge, it must prove its independence and value by original, definite, and, if possible, quantitative research." To this demand in itself geographers can take no exception, but they have good reason to complain that he should stop where he does, thereby seeming to imply that geography has not yet done so.

To see whether this implication or apparent implication is just let us consider carefully the nature of his demand. By using the term "original" he does not mean to make the preposterous demand that our work should not be based on the labours of others, for he has just stated that in

our original investigations "we have the right to all the results obtained by others, provided that we add something valuable of our own." In demanding definite research, and we presume research leading to definite results in the way of demonstrated effects connected with place conditions, he does not insist that the degree of those effects should be capable of being expressed quantitatively, and that being so it would be easy to show by crowds of examples that such results have been arrived at. He adds, however, that the research should, if possible, be quantitative. To this demand also geographers will take no exception, even though they will readily admit that the measuring of individual influences connected with place is for the most part a matter of great difficulty if not utterly impossible. Probably in every case there are different influences connected with place at work at the same time in bringing about certain results, and the utmost that can be shown quantitatively is the joint effect of those causes. Still, many examples can be given of quantitative results that clearly show at least approximately the degree in which influences connected with place operate. That is shown, for example, when calculation reveals a certain amount of correspondence, other things being equal, between the amount of the rainfall or the altitude and the density of population: when maps are constructed showing the limits that may be reached by travellers or goods from a given centre within a given time; when it is shown that the ratio of the entrepôt trade to the total export trade of different ports is constant within narrow limits in different years notwithstanding wide fluctuations in the amount of the trade, or when we find that, year after year, as I shall have occasion to point out to you in a later part of this course, the ratio of the value of cotton goods sent out of the United Kingdom by way of Liverpool and Manchester remains just about two-thirds of the whole in spite again of great fluctuations in the total. It may be objected that these are all individual instances and that it would be a higher achievement to arrive at a general law expressed quantitatively, a law, for example, that would enable us to state with reference to all ports the proportion of entrepôt trade that might be expected to fall to them. Granted, but that is obviously more difficult, and, if such a law is to be reached at all, it must be by means of individual quantitative results such as have been instanced, which therefore are illustrations of scientific method.

What I have said here may be regarded as a weakness in the subject of geography. So it is. It would injure the subject to blind ourselves to the degree of definiteness attainable in its investigations. The result of investigation may be definite in this sense, that the fact of the operation of causes connected with place may be shown in multitudes of cases where they are not obvious, but we may be compelled, after careful consideration of the various influences at work in individual cases, to content ourselves with a mere estimate of their relative importance. One consequence is that it may be safely asserted that no geographer would agree with all the estimates of any other geographer, even although there is substantial agreement on the more important points, and, in consequence of continued investigation, more and more of an approach to agreement. Parenthetically it may be observed that this weakness in geography is not without

its advantages from an educational point of view, inasmuch as nearly every separate case in geography affords special exercise for thought. Still I would have you observe that this is merely a parenthesis. Our subject at present is not geography as a discipline, but the field of investigation belonging to geography. In connection with that, however, I may remark that if there is, as I contend, such a field, the very weakness that I have indicated, increasing as it does the difficulty in cultivating it, is no reason for the field being abandoned, but quite the reverse.

Just one other point in Colonel Close's observations I will take note of. He admits that no student of history, economics, or politics can disregard the effect of geographical environment, but adds that it is not as a fact disregarded by writers on those subjects, and he apparently wants us to believe that it may safely be left to them to pay due regard to the influence of that environment. Now if that is the implication of Colonel Close's observation I would put to him this question:—If such is really the case is it not a little remarkable that Ernest Lavisse, in writing his great history of France, feeling the necessity for an introductory volume on the geography of France, should not have written that volume himself, but should have entrusted it to a trained geographer, Professor Vidal de la Blache?

It is somewhat noteworthy that this presidential exposition on the subject of geography should have been given in a year in which several important works have been published illustrating the scientific treatment of geography from the point of view to which Colonel Close gives such scant recognition.

Of the works to which I refer, I will first mention a small book by Dr. Marion I. Newbigin, entitled *Modern Geography*.[1] Small as it is, I would direct your special attention to it. With her well-known literary skill the author succeeds in rousing the reader's interest from the first page, and in the space of less than two hundred and fifty small pages indicates the numberless ways in which influences connected with local differences in surface-relief and the modelling of that relief, climate and weather, the distribution of plants and animals, wild and cultivated or domesticated, the distribution of minerals and other things make a difference to man. The reader is thus brought to see in how many directions he must be on the watch in order that he may be able to make a fair estimate of the total sum of influences connected with the geographical environment, that he may be able to judge how far it is possible for man, according to our present knowledge, to modify that environment to his own advantage, and to discern the modes in which by his own action he may unintentionally modify it to his disadvantage.

The two other works of which in this lecture I propose to give an account are of a different kind. They are both works of considerable size and great learning, and both aim at giving an original treatment of the subject of human geography. The first of these works to appear was *La Géographie Humaine*, by Jean Brunhes, Professor of Geography

[1] London: Williams and Norgate (Home University Library), 1911.

in the Universities of Fribourg and Lausanne.[1] The other is *Influences of Geographic Environment*, by Ellen Churchill Semple.[2] Both have the same aim. They are both strictly a study of influences on man connected with place, an aim indicated in Miss Semple's work by the completion of the title with the words *on the basis of Ratzel's System of Anthropo-geography*. But notwithstanding this similarity of aim, there are interesting differences in plan and method. I will take them up in the order in which they appeared.

Of all the works on geography with which I am acquainted, that of Professor Brunhes is the one that presents the most remarkable combination of the results of direct observation and research. The author has travelled widely in Europe and in North Africa, and everywhere he has observed minutely with a view to the bearings of what he saw on human geography, and has reinforced his observations with records of the camera, many of which serve to illustrate his volume. His research is likewise minute, and for all other workers in the same field the value of his book is greatly enhanced, not merely by the number of references in his notes, but by the indications he gives as to the precise value or nature of the books and papers referred to, especially such as are insufficiently known, or, it may be, nowadays more known by name than read and studied as they still deserve to be. The work extends to more than eight hundred pages of a large octavo, exclusive of the index and contents, and hence it does not surprise one to learn that it is the result of labours spread over ten years.

Definiteness may be said to be the primary aim determining the plan of the work. It is for that reason that the author lays so much stress on direct observation in the study of geography. Thus only, he thinks, can we adequately ascertain the nature of the connection between human activities and facts of geographical distribution. He emphasises, it should be said, the term connection. "Between facts of a physical order," he says, "there are sometimes relations of causality: between the facts of human geography there are only the relations of connection" (pp. 780-81). By this he means, however, only what is involved in what I have stated above, that place conditions have no influence in themselves apart from influences that are not geographical. Coal, he points out, has existed where it exists now since the beginning of history. That it should have the connection it now has with human activity involved, not merely the fact that it can be used to develop heat, and that that heat again can be used as a means of applying power, but involves also the co-operation of a psychological element, man's knowledge of that fact, and the development of man to that stage of civilisation in which he had the desire to use that power.

In order to analyse as definitely as possible the nature of the connections between human facts and other facts of distribution, he asks us, as Suess has done in the beginning of his great work on *The Face of the*

[1] Paris: Félix Alcan, 1910.

[2] New York: Henry Holt and Company. London: Constable and Company, 1911.

Bird's-eye view of the Limmat and the town of Zurich. [*Photo Ed. Spelterini.*

The Jungfrau and the valley of Lauterbrunnen. [*Photo Ed. Spelterini.*

Earth, to imagine ourselves raised above the surface of the earth high enough to have a considerable extent of the surface registered on a photographic plate. He then asks us what are the human facts that would be there represented. First of all, he says, men themselves, but besides men, and all the more abundantly where men are most numerous, other concrete things which are reducible to six essential types forming three groups. The first group he calls "Phenomena of sterile occupation of the soil," including (*a*) houses, and (*b*) roads. These phenomena he illustrates by a bird's-eye view from the height of 650 feet of the Limmat and the town of Zürich, in which, he remarks, houses, streets, bridges, etc., are just as distinctive features of the earth's crust as the river, and by setting this view in contrast with a similar view taken from the height of about 8000 feet of the massif of the Jungfrau and the valley of Lauterbrunnen, a view in which the only discernible human fact is a winding white line which represents the railway ascending to the Little Scheidegg. (See Plate.)

The second group he calls "Phenomena of conquest in vegetable and animal life," divisible into (*c*) cultivated fields, and (*d*) domestic animals. The third group is composed of "Phenomena of destructive economy," what the Germans call *Raubwirthschaft*, literally robber-culture, divisible into (*e*) mineral exploitations, and (*f*) vegetable and animal devastation (pp. 63-70).

None of these results or forms of human activity could be exhibited without the aid of certain natural forces, above all, water, wind, and human beings, but in thus speaking of water, for example, as a force Professor Brunhes refers not merely or principally to its use under the head of what we call water-power, but also to all its other uses, as for drinking, drainage, irrigation, etc.

All the facts of human geography, however, can be and ought to be examined in the light of the six above mentioned essential phenomena.

Chapters iii., iv., and v. of the work are accordingly devoted respectively to each of the three groups of those phenomena. Houses and roads, therefore, form the subject of Chapter iii., in which the connection is shown between the geographical conditions and the form and structure, including the materials, of the house, between them and the material characters of streets and roads, the grouping of houses in villages and towns and the localisation of such human agglomerations, the means of communication within towns, and finally the general geography of the means of communication. The treatment is not exhaustive, but for the most part by means of illustrative types, such as the wooden houses of northern and central Europe, houses and villages in different parts of Egypt. Generally construction is considered with reference to cases in which the means of transport are still defective, so that it is inevitable that the materials used in construction, necessarily costly to transport, are those found on the spot. There is no consideration of the parts of North America in which the spread and multiplication of population have depended on the introduction of modern methods of transport, and where accordingly we see "frame houses" a characteristic feature of plains hundreds

of miles distant from the source of the timber. It should be noted, however, that elsewhere Brunhes, while agreeing with Ratzel in observing that with advancing civilisation the dependence of man on geographic conditions is not suppressed but merely becomes changed (p. 804), expressly points out that highly developed civilisations are in a very large measure independent of the tyranny of the immediate geographic environment (p. 618). It is in virtue of this growing independence that timber of distant origin is made available in prairie house-building—in the building indeed of our own houses.

In the chapter on the geography of cultivation and the rearing of livestock, plants and animals are first considered in relation to the great facts of climate. Another section deals with the origin, number and importance of cultivated plants and domestic animals. The cereals most extensively cultivated are then considered separately with reference to the geographical conditions favouring their production. A section is devoted to the leading textile fibres individually treated, and lastly there is a very interesting section on the various forms of pastoral nomadism and semi-nomadism.

Under the head of destructive economy the two types chiefly dealt with are forest devastation as illustrated by the mode of life of the Fang in equatorial West Africa, and coal-mining, "the type *par excellence* of mineral exploitation on a great scale."

These matters being disposed of, the author, again with the view of securing the greatest possible degree of definiteness in the treatment of his subject, takes up in the next two chapters the consideration of small natural units of the type which he calls "islands," these small units, he thinks, forming the best introduction to the study of the totality of geographical factors affecting a region. Four types of islands or islets of humanity (*d'îles ou d'îlots d'humanité*) appear, he says, "to fall naturally under our observation: islands of the sea: oases, which are the islands of the desert; the peopled 'islands' or 'oases' of the great northern or equatorial forest: and the elevated enclosed valleys of mountainous regions, which are also 'islands' or 'oases' isolated in great altitudes" (p. 71). But of these four types only two are treated at length, the "Islands of the Desert" (Chapter vi.), and the "Islands of the High Mountains," of which the Val d'Anniviers is taken as the type (Chapter vii.). Both chapters are based entirely on personal observation, and are of great interest. Both these "island" types, it will be observed, are kinds of islands in which the geographical conditions place special difficulties in the way of external communication, and there is no special treatment of what are commonly known as islands, one characteristic of which is that their surroundings generally favour such external communication in a high degree.

The eighth chapter has the general heading of "Beyond the Essential Phenomena," and deals with regional geography, ethnography, social geography, and historical geography. Characteristically Professor Brunhes recommends the commencement of the study of regional geography with that of *pays*, or well-defined small natural regions. Notwithstanding the general heading, however, he avers that as geographers

we claim to penetrate into the territory of economic and social questions only in so far as the three groups of essential phenomena will explain or can be made use of in explaining the social facts by their localisation or their special forms (pp. 628-9), and it is apparently in virtue of the application of this criterion, with a negative result, that he excludes from human geography the study of races and languages, holding that as regards the facts of race and language the terrestrial world has not acted or does not act at all, or acts in a manner so infinitesimally small that our means of observation are incapable of detecting and measuring that action (p. 626).

A chapter follows treating of geography in education, and in the last chapter, entitled "The Geographic Mind," the author shows, among other things, how the disposition to regard things from a geographic point of view is extending in economic, social, and historical investigations, and in intensified efforts on the part of man to adapt himself to geographic conditions.

In Miss Semple's work on *The Influences of Geographic Environment* it is not minute personal observation that forms the dominant feature, but great width of survey. Geography is indeed indebted to the author of this work for many such minute studies in widely different parts of the world, some of the results of which are naturally taken into account in this book. But the basis of the present work is wide learning followed up by close study of the enormous range of facts which have thus been brought under review. In accordance with this there is a difference between this work and that of Professor Brunhes in the style of illustration. Here there are none of the photographs of geographical features that constitute so essential a characteristic of *La Géographie Humaine*. All the illustrations are in the form of maps. The chapters all deal with large subjects, and from every one of them can be gleaned interesting illustrations of geographic influences, absolutely definite in the sense above indicated, yet not to be arrived at without such wide and careful study, and serving in many cases to warn us against explanations which without such study have a delusive appearance of simplicity.

The first chapter, entitled "The Operation of Geographic Factors in History," is of a general introductory character, giving various illustrations of influences that fall to be treated separately, according to their nature, in subsequent chapters. From it we may note the emphasis laid on the distinction between direct and indirect effects of climate, and the illustration drawn from the differentiation of colonial peoples. Many have ascribed the rapid modification of the physical and mental constitution of immigrants from Great Britain into North America, South Africa, Australia, and New Zealand simply to the effect of climate. "The prevailing energy and initiative of colonists have been explained by the stimulating atmosphere of their new homes. Even Natal has not escaped this soft impeachment. But the enterprise of colonials has cropped out under almost every condition of heat and cold, aridity and humidity, of a habitat at sea-level and on high plateau. This blanket theory of climate cannot, therefore, cover the case. Careful analysis supersedes it by a whole group of geographic factors working directly and indirectly."

First we have to consider that before the days of cheap ocean transport and hustling steerage agents the ocean barrier had the effect of calling out from the home country only men of abundant energy, and these often with superior qualities of mind and character. Then, further, their new environment favoured variation and the perpetuation by heredity of the original characteristics, and the modified type soon became established because the abundance of land encouraged a rapid increase of population; that, too, under conditions that banished carking care, begot a hopeful attitude of mind, and yet constantly presented new problems to be promptly solved by individual ingenuity and resourcefulness (pp. 18-22).

The second chapter deals with "The Classes of Geographic Influences" under the four heads of physical effects of environment, psychical effects, economic and social effects, and effects on the movements of peoples. The direct action of physical conditions is sometimes too clear to be mistaken. "For instance, we can hardly err in attributing the great lung capacity, massive chests, and abnormally large torsos of the Quichua and Aymara Indians inhabiting the high Andean plateaus to the rarefied air found at an altitude of 10,000 or 15,000 feet above sea-level. . . . When the Aymara Indian descends to the plains . . . he either dies off or leaves descendants with diminishing chests" (p. 34). Sometimes this influence is indirect, arising from the fact that the geographical conditions impose certain predominant activities. Thus, thin legs with well-developed arms, chests, and shoulders, have all been noted as characteristics of tribes living in boats on rivers of South America and South Africa, and on the shores of the islands of Tierra del Fuego, British Columbia, Alaska, and the Aleutian Isles (pp. 35-6). Of psychical effects an interesting illustration is drawn from Blackstone, who states that "in the Isle of Man, to take away a horse or ox was no felony but a trespass, because of the difficulty in that little territory to conceal them or to carry them off, but to steal a pig or a fowl, which is easily done, was a capital misdemeanour, and the offender punished with death" (p. 40), a state of matters which, so far as the horse is concerned, may be instructively contrasted with the opinion cherished on the prairies of North America and other parts where the facilities for horse-stealing are greater. Economic and social effects, it is pointed out, are especially significant where they determine the size of the social group, as in Chinese Turkistan, where the need of irrigation scatters the population in detached spots of various size from the oasis of Kashgar with its 60,000 inhabitants to the "single families which Younghusband found living by a mere trickle of a stream flowing down the southern slope of the Tian Shan" (p. 43). Of the effects upon movements of peoples due chiefly to the character of the features of the earth's surface the illustrations are so numerous that it is needless to specify any in particular.

The chief lessons of the third chapter, headed "Society and State in relation to the Land," may be said to be summed up in the statements that the anthropogeographer "sees the common territory exercising an integrating force . . . growing stronger with every advance in civilisation involving more complex relations to the land—with settled habitations, with

increased density of population, with a discriminating and highly differentiated use of the soil," and in other ways (p. 53), and that "this growing dependence of a civilized people upon its land is characterised by intelligence and self-help. Man forms a partnership with Nature, contributing brains and labor, while she provides the capital or raw material in ever more abundant and varied forms" (p. 71).

Under the head of "The Movements of Peoples in their Geographical Significance," which forms the subject of the fourth chapter, we may note the emphasis laid on "the vast sum of lesser but more normal movements which by slow increments produce greater and more lasting results" than the few conspicuous migrations to which history is prone to direct almost exclusive attention (p. 76). "It was the great intellectual service of Copernicus," we are told, "that he conceived of a world in motion instead of a world at rest. So anthropogeography must see its world in motion, whether it is considering English colonisation, or the westward expansion of the Southern slave power in search of unexhausted land, or the counter-expansion of the free-soil movement, or the early advance of the trappers westward to the Rockies after the retreating game, or the withdrawal thither of the declining Indian tribes before the protruding line of white settlement, and their ultimate confinement to ever-shrinking reservations" (pp. 79-80).

The fifth chapter has the most comprehensive title of all, that of "Geographical Location," under which head we are to include not merely the size and form of the geographical subject, whether country, island, city, or whatever else it may be, but also its relations to other regions (p. 130). With this wide content for the term it is hardly to be wondered at that the author should state that "the location of a country or people is always the supreme geographical fact in its history. It outweighs every other single geographic force." It is obvious that under this large heading a great variety of considerations must come under review, but I will draw attention only to one, which contains a recognition of a fact of the most vital importance in geography, one to which we have already had occasion to refer, namely, that geographic values are subject to change. According to Miss Semple, location is the geographic factor "most subject to the vicissitudes attending the anthropogeographical evolution of the earth. Its value changes with the transfer of the seats of the higher civilisations from sub-tropical to temperate lands: from the margin of enclosed sea to the hem of the open ocean: from small naturally defined territories to large, elastic areas," and so on (p. 150).

With the wide meaning given to location it is not surprising to find that most of the following chapters of the book treat of geographical location in a number of special aspects. The subjects of chapters vi. to xvi. inclusive are "Geographical Areas"; "Geographical Boundaries"; "Coast Peoples"; "Oceans and Enclosed Seas"; "Man's Relation to the Water"; "The Anthropo-geography of Rivers"; "Continents and their Peninsulas"; "Island Peoples"; "Plains, Steppes and Deserts"; "Mountain Barriers and their Passes"; and "Influences of a Mountain Environment." Time fails me to give any account of these chapters individually,

and for my present purpose it is not necessary. I have perhaps already said enough to give you an idea of this important work, with which I hope that some of you at least will make yourselves better acquainted by careful study. Your attention may, however, be directed with advantage to a few of the points dealt with in the chapters enumerated. In that on "Boundaries," there are some interesting paragraphs on natural boundaries being essentially zones not lines, areas of scanty population lying at a distance from the centres of power, and within which the artificial boundary line is liable to move, an idea developed at length also in Lord Curzon's well-known lecture on *Frontiers*.[1] People are apt to think of rivers as natural boundaries, but in the chapter on "Rivers" it is rightly pointed out and illustrated by numerous instances that it is "only under peculiar conditions" that rivers become effective as ethnic, tribal, or political boundaries (p. 361). "Rivers unite." That is one of their main functions, especially where easily navigable, a fact enforced by still more numerous instances (pp. 357 ff.). "The Connecticut River Settlers of early colonial days laid out all their towns straight across the valley, utilising the alluvial meadows on both banks for tillage, the terraces for residence sites, and the common river for intercourse." If one asks for illustrations of definite geographical influences on human activity it would be difficult to produce a more decisive case than that quoted from Parkman in token of the importance of the navigable rivers in early days in Canada:—"One could have seen almost every house in Canada by paddling a canoe up the St. Lawrence and Richelieu." Every dwelling faced on this water thoroughfare. "The original grants measured generally 766 feet in width and 7660 in depth inland: but when bequeathed from generation to generation, they were divided up along lines running back at right angles to the all important waterway." "In the early Connecticut River Settlements, the same consideration of a share in the river and its alluvial bottoms distributed the town lots among the inhabitants in long narrow strips running back from the banks" (p. 366).

The long chapter on "Island Peoples," extending to fifty-seven pages, makes up for the lack of such a chapter in Brunhes' *Géographie Humaine*, and here due attention is paid to the accessibility of islands. But islands, it is pointed out, have double and opposing influences. In the lowest stages of civilisation it is their segregating influence that is most marked in relation to man, as it always is in relation to plants and other animals than man: but while this segregating influence never ceases to operate, with higher development and advancing nautical efficiency islands "become points of departure and destination of maritime navigation, at once center of dispersal and goal, the breeding place of expansive national forces seeking an outlet, and a place of hospitality for wanderers passing these shores" (p. 412).

The last chapter of the volume deals with "The Influence of Climate." The author points out that climate enters fundamentally into all consideration of geographic influences, either by implication or

[1] Oxford, Clarendon Press, 1907.

explicitly, in consequence of which all the other chapters have been indirectly concerned with climate to no small degree; but this final chapter contains a general view of the relations of climate, mainly indirect, to human activity, and I may wind up this account of Miss Semple's volume by citing an interesting illustration of indirect and unobvious geographic influence under this head. The climate of Argentina affords a long growing season as compared with the wheat and maize growing areas of North America. This enables the Argentine farmer to stretch out his period of sowing and reaping and thus till a larger area. The International Harvester Company of North America has discovered that this reduces the demand for agricultural machinery since the implements are able to serve about twice the acreage usual in the United States, as each can work twice as long.

It seems to me that even the brief account I have thus given of these two works shows that they amply meet the demand of Colonel Close for original definite research in geography, and justify the language I made use of on the occasion of the inauguration of this lectureship in 1908, when, after expressly emphasising a number of the points on which Colonel Close lays stress, I went on to say :—

"But these illustrations of the duty of the geographer may perhaps give rise to the objection that after I have handed over one part of geography to the geologist, another to the meteorologist, and others to the botanist and the zoologist, and have nevertheless found it necessary to make even the anthropogeographer trench on the ground of all of them, I am now making him trench on the domains of the historian and the economist. My reply is that I frankly admit it, but that in regard to the life of man so important are the influences attached to local conditions and place relations, that it is of the highest consequence to have a class of investigators whose constant and single aim is to see that the known causes that affect the value for man of place are never overlooked, and to be always searching for unknown causes that have the same effect. And I think I may add as a proof of the weight due to that consideration that it is not among economists and historians that such studies are discouraged, but rather among them that geography, specifically anthropogeography, as a separate branch of study finds some of its most ardent supporters."[1]

[1] *Scottish Geographical Magazine*, 1908, pp. 573-4.

Note.—The two illustrations on the accompanying plate are drawn from Prof. Brunhes' book, the blocks having been kindly lent by M. Felix Alcan, the publisher.—Ed. *S.G.M.*

NOTES ON THE GEOGRAPHY OF THE EDINBURGH DISTRICT.[1]

(Sheet 32 of the One-Inch Map of the Ordnance Survey.)

By James Cossar, M.A., F.R.G.S.

(With Maps and Illustrations.)

The area included in Sheet 32 of the One-Inch Map lies between the parallels of 55° 47′ 30″ and 56° 3′ 10″ N. latitude and between 2° 59′ and 3° 36′ W. longitude. It embraces the greater part of Midlothian and about two-thirds of Linlithgowshire. One or two small patches of the counties of Lanark and Peebles project into the area along its southern margin: on the eastern side a considerable part of the Haddingtonshire parishes of Prestonpans and Tranent is included, but, on the other hand, the Midlothian parishes of Stow, Heriot, Fala and Soutra, and parts of Crichton and Cranston appear on the adjoining sheet. The total area of this part of the region at high water amounts to 315·2 square miles, of which 0·55 per cent. consists of inland drainage in the form of lakes, ponds and reservoirs.

Along the northern margin of the map a small portion of Fife, covering an area of a little over fourteen square miles at high water, is also represented. Between these two land areas there stretches the estuary and Firth of Forth, extending to 100·39 square miles at high tide, while between low and high water marks there is an area of $10\frac{3}{4}$ square miles.

The configuration of the channel of the Forth calls for notice not only on account of the light it throws upon the past and present physical conditions of the district, but also because of its influence upon the lines of communication and transport within the region and its effect upon the larger world relations of the place, strategic as well as economic.

Between Bo'ness and Queensferry the estuary consists of a shallow channel, less than two and a half miles from shore to shore, with an ESE. direction. At the latter place, however, a marked change takes place in the form and direction of the Forth. At this point the Fife shore projects southwards to within a mile of the Linlithgow side, and the channel of the stream here consists of two parallel troughs, separated by a long steep-sided ridge, the summit of which forms the island of Inchgarvie. The hollow between this island and the northern shore has an average depth of twenty fathoms, while its maximum depth of forty-two fathoms constitutes the deepest part of the whole Firth. The trough on the south side of Inchgarvie is shallower, but at one or two points it reaches a depth of thirty-five fathoms. The existence of these deep channels at the head of the Firth has proved an important factor in the selection of Rosyth as the site for a naval base and dockyard port, and

[1] A Paper read before Section E (Geography) of the British Association for the Advancement of Science, Sheffield, 1910.

long before a bridge was made to span them the narrow passage of the Forth at this point determined one of the main routes from north to south.

To the east of Inchgarvie the Forth begins to lose its estuarine character and gradually widens, until at Cramond the opposite shore is about four miles distant at low tide, while at Prestonpans, at the eastern limit of the district, the Firth attains its greatest width of sixteen miles, although the northern shore at this point does not appear on the present sheet. Below Queensferry the bed of the Forth slopes very gently from its southern shore, and at Musselburgh a depth of ten fathoms is only reached at a distance of nine miles from the coast. On the opposite side the slope is much steeper, and between the mainland and Inchcolm a deep channel runs in an east-north-east direction for over two miles, while between this island and the small rock of Oxcars there is a parallel and deeper trough which at one point attains a depth of thirty-five fathoms: this marine valley is prolonged with one or two slight interruptions to the north of Inchkeith. The parallel trend of these hollows is all the more remarkable because they correspond in outline as well as in direction to a series of grooves that are of frequent occurrence on the mainland. The elevated masses between these hollows have almost entirely disappeared with the drowning of the valley, but here and there their highest points still remain above the surface, forming isolated rocks or small islands, which together do not cover 150 acres, but are of some importance from the point of view of navigation, necessitating the very careful charting of the Firth and the planting of buoys, beacons and lighthouses at short intervals. The largest of these islands, Inchkeith and Inchcolm, are of interest on their historical side; the former may mark the site of an insular city to which Ptolemy makes reference: to-day it plays an important part in commanding the passage of the Forth, an importance which will certainly not diminish with the completion of the naval base. Inchcolm, on the other hand, has been the site of an ecclesiastical house since early in the twelfth century.

That part of the Fife coastline which faces towards the sea forms a number of small bays, but being exposed to the influence of strong tidal currents these tend to silt up rapidly, and at low tide they are practically devoid of water. If the small ports along this part of the coast are to have any share in the development that is going on a few miles to the west and are again to enjoy something of the prosperity which belonged to them in former centuries, when the shallow harbours were quite sufficient for the shipping of those times, drastic measures will have to be taken to deepen the harbours and to maintain an open channel.

On the opposite side of the Forth the shoreline forms a wide but shallow double curve from Prestonpans to Leith and from the latter place to Hound Point. The distance between Grangepans on the west and Prestonpans on the east is 24 miles when measured along a straight line, while the actual shoreline between these two points only amounts to 29½ miles.

To the west of the Forth Bridge the straight shoreline is interrupted by projecting masses of hard rock only at Abercorn and Blackness. But

the constriction of the Forth at Queensferry and the influence of the tidal currents in checking the flow of the river have led to the deposition of wide tracts of mud along this part of the coast. A similar effect of the tides is seen at the mouth of the Almond, where at low water a wide stretch of sand and mud is exposed over which it is possible to maintain communication on foot with the island a mile from the shore. Proposals have been made from time to time to reclaim parts of the foreshore in the neighbourhood of Bo'ness and Grangepans, and much has already been accomplished by individual effort, especially by the lairds of Grange. If an extensive reclamation scheme could be carried through, not only would many acres of valuable arable land be added to the county, but a marked improvement could at the same time be effected in the conditions of navigation in this part of the Forth (a matter that might become of urgent necessity with the construction of the proposed ship canal), and it is just possible that the amenity if not also the salubrity of the neighbourhood would be increased.

The configuration of the Forth exerts a very marked influence upon the physical conditions of the water in the firth and estuary, and probably to some small extent upon the temperature of the district. An examination of the statistics of the temperature of the water of the Forth reveals a marked difference between the fresh water in the shallow river bed and the water in the firth drawn from the open sea.

The average temperature, derived from the means of the surface and bottom layers of water, observed in mid-channel during a period of three years gave the following :

	Jan.	April.	July.	Oct.	Yearly Average.	Yearly Range.
Between Grangemouth and Alloa,	35° F.	43°	60°	53°	47·5°	25°
Between Blackness and Oxcar,	37°	43·5°	58°	53°	47·5°	21°
Between Inchkeith and Elie,	39°	43·5°	55·5°	53	47·5°	16·5°

Thus the river water is several degrees colder in winter than that of the areas nearer the sea : on the other hand, it is warmer during summer in just the same proportion. The temperature also differs considerably with the depth of the water, and in summer the great sandy shelf that is exposed at low tide for several miles along the coast from Hound Point to Prestonpans raises the temperature of the water above that in the middle of the firth. On the other hand, the influence of this beach is just as powerful in the other direction during the winter months. But in this matter the time of low tide is an important factor. Moreover, the fact that the upper layers of water are always a few degrees colder than the bottom layers in winter, and correspondingly warmer in summer, makes the question of the prevailing winds an important consideration in studying the temperature of the adjoining coast.

The configuration of the Forth also exerts a marked influence upon the behaviour of the tides and the salinity of the water. From the following table of observations made by the Scottish Marine Station at Granton several years ago it will be seen there is an abrupt change in the salinity of the water and in the effect of the tides to the west of Inchkeith. The change in the percentages of sea and river water at low

and high tides increases as the head of the firth and the estuary are approached.

	Per Cent of River Water.	Per Cent of Sea Water.	Per Cent of River Water.	Per Cent of Sea Water.
	High Tide.		Low Tide.	
(Off Alloa,	95·5	4·5	100	0·0)
Off Blackness,	13·5	86·5	16·8	83·2
Off Queensferry,	9·7	90·3	11·2	88·8
Off Oxcar Rock,	7·1	92·9	9·0	91·0
Off Inchkeith,	4·5	95·5	...	...
Off Isle of May,	1·9	98·1	...	...

Dr. Mill has pointed out that in the estuary and the upper part of the firth the difference in salinity between the bottom and surface waters is almost the same as the difference between waters at the same level at two points from four to six miles apart. Thus the bottom layers at Blackness have the same degree of salinity as the surface waters between Queensferry and the Oxcar Rock. The tributaries that empty their waters into the firth affect its salinity in rather an interesting manner. At low tide the streams of fresh water brought down by the Esk and the Almond are carried some distance from the shore, and gradually mingle with the water of the firth, but at high tide they are held up at their mouths and are compelled to creep along the shore, with the interesting result that the marginal water at Granton is fresher at high tide than at low.

Along the shore on both sides of the Forth considerable stretches of sand have played an important part in the development of the district, for besides furnishing supplies for building purposes, they have encouraged the growth of several holiday resorts at various points along the coast. Portobello is perhaps the best example, although Musselburgh owes much of its prosperity to its stretch of sandy beach and the links of blown sand behind it. Indirectly the shifting tidal currents of the firth may prove a dangerous factor to the prosperity of such places, because not infrequently they may sweep away the tracts of sand upon which so much depends: this seems to be going on in the vicinity of Joppa, and where the beach was formerly covered with a wide stretch of beautiful sand, there is now a long tract of coarse shingle and pebbles.

The deposits of sea sand are not, however, confined to the present shoreline. In a small pit that was open recently at Granton, at a height of about 25 feet above the present level of the sea, a thin band of littoral shells could be traced throughout a thick mass of sand about two feet below its surface: in an adjacent excavation a band of shingle such as is to be found anywhere along the coast at the present day, lies about four feet below the surface of the sand. Similar phenomena are common at various points along the coast from Granton to Seafield, especially where excavations are being carried out. The character of these deposits leaves little doubt that the terrace or platform on which they lie is a former beach that has been raised above its old level. It is probable that the movement which gave rise to this platform took place within comparatively recent times, and may even have been developed since the Roman occupation of the country.

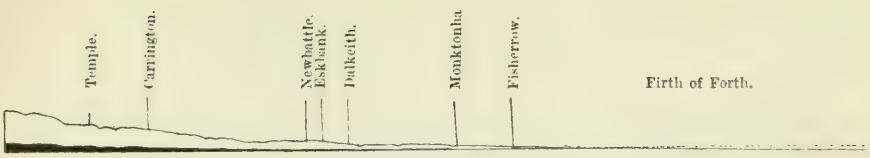
This raised beach has played an important part in the development of the region by furnishing the sites for a line of fishing villages and trading centres along the coast: on it Musselburgh, Portobello, Seafield, Leith, Newhaven and Granton have taken their rise: on the opposite side of the Forth several of the factories of Inverkeithing have been built upon this platform, within easy reach of the harbour. But probably on account of the comparatively recent formation the deposits of this platform are very easily eroded, and there is abundant evidence that a considerable tract of land has disappeared from this part of the coast within recent centuries: there is now no trace of the links which formerly existed at Newhaven, and with the rapid wasting of the coastline the direction of the roads skirting it have been considerably altered. Within much more recent times the sea has apparently encroached some considerable distance, and the low-water mark at Leith now stands higher than it did eighty years ago, when the boundaries of the burgh were defined. On the other hand, it is interesting to note that much of the blown sand which forms the links at Musselburgh has evidently accumulated since the times of Mary, Queen of Scots, in whose day, it would appear, the sea extended to the inner margin of the present links.

The 25-feet terrace that skirts the shore is but one of a series of similar terraces that can be traced at different levels above the present shoreline on both sides of the Forth. The best developed is the 100-feet terrace, which can be traced for several miles: but in other cases these sea margins are far from continuous, and sometimes can only be identified by the narrow shelves incised in masses of projecting rock. The chief interest of these ancient sea margins lies in the evidence they furnish of changes in the relations of the land and water of the district. Their distribution is indicated on the geological map: the extension of these raised beaches in the vicinity of Edinburgh and up the valleys of the Almond and the Esk is worthy of note. For the most part, however, the traces of the former sea cliffs have disappeared, but the bluffs to the west of Granton and beyond Queensferry seem to be the modified remnants of an ancient sea-front.

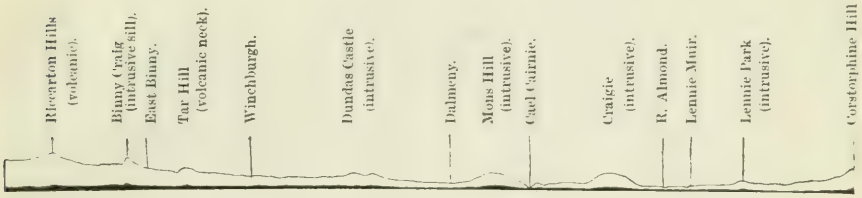
Topographical Features.

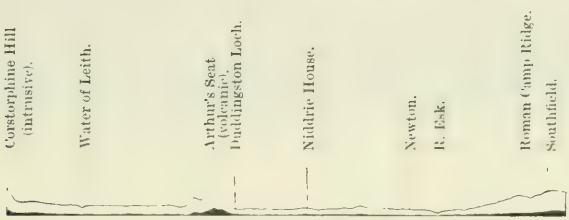
The dominant physical feature of the district is the line of heights formed by the Pentland Hills, which extend from the outskirts of the capital in a south-westerly direction right across the region and are continued into the adjoining counties of Peebles and Lanark, where they are separated from the southern uplands by the valley of Clydesdale. This line of hills consists of a mass of ancient resistant sandstones, conglomerates, lavas and tuffs, much deformed and faulted, reduced first by normal processes and then by slow glacial action to domes and broad-shouldered spurs of moderate to low relief, of medium texture, with its ice-deepened main valleys in a stage of early maturity, while the headwaters and tributary streams are still for the most part in their youthful stage of development.

The elevated mass of hard rocks is bordered on the east, north and

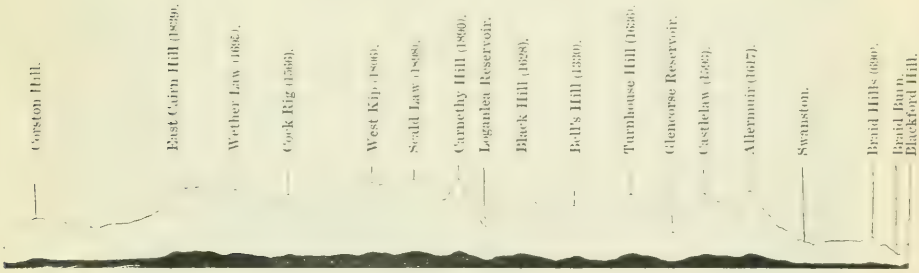


A.—Section along the Midlothian basin from South to North.

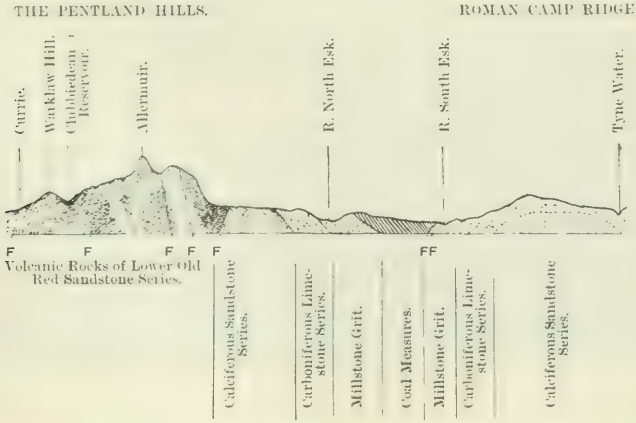




B.—Section across the region from West to East, showing the influence of the igneous rocks upon the topography.



C.—Section showing the Pentland passes. The vertical scale is four times the horizontal.



D.—Diagrammatic Section showing the relation of the rocks between Currie and the Tyne Water.

west sides by a gently undulating plain of softer structure, which slopes gradually from the base of the hills to the shores of the Forth, but has its outline frequently interrupted by crags or low knolls and ridges of more resistant rocks, which rise, sometimes very abruptly, above its surface. This lowland tract is enclosed at its western end by another line of volcanic hills, trending NNE., but of much lower relief and of coarser texture than the Pentland mass. Along the eastern margin of the sheet the lowland is interrupted by a low anticlinal ridge, with an average height of 400 feet and a maximum of less than 800 feet, running in a direction roughly parallel to that of the Pentlands from near the coast at Prestonpans to Borthwick, where it is cut off by the valley of the Gore Water from the Moorfoot Hills and the southern uplands.

The Pentland Hills extend across the district for about sixteen miles, and vary in breadth from four to eight miles, gradually narrowing towards their northern end. On their north-western side they have a moderate slope to the plain that stretches from their base to the Forth: the slopes to the south-east are somewhat steeper, and at their truncated northern end they present a very bold escarpment towards the city of Edinburgh (Fig. 1). The upland area above 1000 feet covers 29·32 square miles and forms 9·24 per cent.[1] of the total land area to the south of the Forth: the area over 1500 feet amounts to 3·77 square miles and forms 1·19 per cent. of the whole. The maximum elevation is reached in Scald Law (1898 feet), while Carnethy is only a few feet lower: and it is worthy of remark that between the chief summits of the hills there is a comparatively small difference in height, and many of them are separated from one another by minor depressions (Section C).

Here and there, as on the steep sides of Caerketton, or along the escarpment of the Cairn Hills, there are rugged and precipitous cliffs and scree-covered slopes: but for the most part the hills present a very gentle outline with smooth rounded summits, separated by picturesque valleys, in several of which reservoirs have been constructed, or by bleak boulder-strewn cols, and are covered with a varied vegetation of pasture and heath and small patches of peat (Figs. 2 and 9 and the geological map). The hills are dissected to a much greater extent towards their northern end, and several of the valleys which run across the belt of hills are out of all proportion to the streams which at present occupy them.

The plain which borders the Pentland Hills may be divided into two parts, differing from one another in configuration, in climate, and even in their economic development.

Eastwards between the Pentlands and the Roman Camp ridge lies a very gently undulating, basin-shaped plain, traversed by the well-wooded valley of the Esk, and falling with almost imperceptible gradient from the base of the hills to the Firth of Forth where, however, it is continued for several miles beneath the surface of the sea. A straight line can be drawn from Temple on the southern margin of the plain, through Dalkeith and Fisherrow, and prolonged seaward until the 100-feet contour is reached, which would show a fall of just 700 feet throughout

[1] See Table of areas appended at end of paper.

Fig. 1.—The northern end of the Pentland Hills (with a thin coating of snow, Oct. 1, 1911).

Fig. 2.—Glencorse Reservoir and Castlelaw Hill (1595 ft.).

its total length of sixteen miles (Section A). Moreover, except at one or two points between the 100-feet contour and sea-level, where the modified relics of former sea-cliffs can be identified, or where it is traversed by the winding valley of the Esk, the plain has a remarkably uniform slope. Until it becomes merged in the lower slopes of the hills in the vicinity of Cauldhall Moor, this Midlothian basin forms a rich agricultural region; but along the base of the Roman Camp ridge and at various points throughout the plain, at Loanhead, Bonnyrigg, Hawthornden, Newtongrange, the development of the mineral resources is rapidly altering not only the type and distribution of the population and of settlements, but also the physical aspect of the district.

In contrast to this area the plain to the west of the Pentland axis presents no such uniformity of outline. The topographical features of parts of this district are essentially those of a drumlin country on a small scale. The long, low parallel ridges, dovetailed into one another and separated by slight depressions, so that before one mound terminates and disappears another has arisen to continue the succession, are characteristic of an ice-moulded country, but in the present instance these are not composed entirely of glacial detritus, but are drift-covered mounds of solid rock. But a still more striking feature in the topography of this part is the number of abrupt crags and long, well-wooded ridges that rise in isolation above the surrounding lowland. The general direction of most of these elevated masses is along an east to west line, and in their relief and sometimes in their vegetation they present a marked contrast to their surroundings. It is this contrast which must strike an observer on the northern shore of the Forth, for it is these eminences that form the most prominent and characteristic features in the landscape against the background of the Pentland Hills. Several important heights stand out within the city of Edinburgh or its neighbourhood. Arthur's Seat, the Calton Hill and the Castle Rock; to the west the prominent landmark of Corstorphine Hill; farther south the Braid, the Blackford, and Craiglockhart hills under the shadow of the Pentland escarpment; still farther west Dalmahoy and Kaimes Hill; Mons Hill which attains an elevation of 300 feet within a few yards of the coast; and the elevated mass still farther west in the neighbourhood of Woodend which reaches a similar height; all these heights form prominent features in this part of the district, and afford a marked contrast to the scenery of the plain lying to the east of the Pentlands. In addition to these crags and hills there are many long swelling ridges which tend to increase the undulating character of the lowland, while many minor mounds and hillocks, sometimes in small groups, for example in the neighbourhood of Linlithgow, add still further to the diversity of the landscape and prevent the tameness of scenery which is characteristic of most ice-dressed countries. Towards the south and south-west the plain rises steadily to the flanks of the Pentland Hills and becomes a bleak moorland, uncultivated and sparsely peopled. But even in the most barren and inhospitable parts of the region, for example, in the vicinity of West Calder, the great heaps of refuse at the pit heads bear witness to the underlying resources.

Geological Structure and Physical History.

The oldest rocks within the district are of Silurian age, but they occur only in a few isolated patches within the Pentland area and in the extreme south-east corner. Their position and distribution in the field, however, is sufficient evidence that after their deposition they were subjected to intense crustal movements, and to a prolonged period of denudation before the Lower Old Red sediments were laid down on the steadily subsiding floor of the vast inland sea of which the Edinburgh area then formed a small part. The most striking event of the Old Red Sandstone period was the violent volcanic activity which set in after the basal beds of sandstones and conglomerates, derived from the Silurian uplands to the south, had been deposited to a great depth on the floor of the lake. The centre from which these volcanic materials were ejected must have been situated towards the northern end of the Pentland Hills, for there they attain their greatest development, and are known to reach a thickness of at least 7000 feet. Towards the south and south-west they gradually thin out and disappear. At the close of this period also the area was subjected to great lateral pressure from the north-west, and as a result an anticline, with its axis running north-east to south-west, and pitching slightly towards the north, formed an elevated mass over the site of the present Pentland Hills. Then a long period followed during which this land mass was probably reduced to moderate relief: certainly denudation proceeded so far that patches of the underlying Silurian strata were again exposed at the surface. In the succeeding geological interval the district, again slowly and perhaps only partially subsiding, was subjected alternately to humid and arid conditions: during the former a series of lakes or lagoons filled the hollows, in which sediments, evidently derived from a region of igneous and metamorphic rocks lying to the north, were laid down. During the prevalence of desert conditions æolian denudation probably furnished large quantities of material which the winds assorted and drifted far and wide. These deposits of Upper Old Red Sandstone reach their greatest development within this district along the north-western flanks of the Pentlands and have given rise to prominent heights in the Cairn Hills, although it is to be remarked that when observed from the north, for example from Binny Craig, the area which these deposits underlie presents a much more even outline than the volcanic zone at the northern end of the hills. The chief interest of these rocks, however, lies in the fact that the conditions under which they were laid down were continued with slight local modifications into the succeeding Carboniferous period, when deposits of the greatest importance from a geographical point of view were accumulated to a great depth over the whole area under consideration. Not only have these Carboniferous rocks profoundly affected the configuration of the district: by furnishing one of the main sources of its wealth, they have determined the distribution and occupations of the inhabitants and, directly and indirectly, controlled the whole economic character of the region.

The accumulation of the carboniferous rocks occupied a vast interval

of time, and the successive series of limestones, sandstones, shales, and coal deposits tell of regular changes in the physical conditions of the area during that period. The distribution and relation of the different groups into which the strata of this system have been subdivided, the Calciferous Sandstone, the Carboniferous Limestone, the Millstone Grits, the Coal Measures, may be examined on the accompanying geological map. While these formations were being laid down volcanic activity was resumed over a large part of the district, and from innumerable vents, lavas and tuffs were intermingled with the sedimentary material, under which the necks were eventually buried. But it is remarkable that this volcanic action seems to have been confined to the area lying to the north and west of the Pentland axis; there is no evidence of it between the Pentlands and the Roman Camp ridge. Over the former area, however, the vents were widely distributed, sometimes in little groups, but usually independently of one another. On the site of Edinburgh itself successive lava flows were ejected which were destined to add one of its most picturesque features to the district, and to form the material of a long controversy and many theories as to their origin.

But it was in the western part of the district that the carboniferous volcanoes reached their greatest number and activity, and ejected the lavas and tuffs which now form a line of hills, running in a SSW. direction, from Bo'ness to Bathgate.[1] Several of the vents are to be identified on either side of the railway line to the east of Linlithgow.

Contemporaneous with this activity, and still more extensive after it had ceased, was the intrusion of a large number of sills and dykes generally with an east to west trend, even where, as frequently occurs, they pierce overlying volcanic rocks. These intrusive masses are widely distributed on both sides of the Forth, and have played an important part in determining the scenery of the region, besides profoundly affecting its development. The intrusion of these igneous rocks was probably connected with the crustal movements to which the whole area was subjected after the close of the Carboniferous period, which led to the development of a long anticline over the Pentland area, pitching northwards along a SW.-NE. axis, and somewhat more steeply inclined on the limb facing the south-east. It is worthy of note that this arch had as its core the remnants of the Lower Old Red Sandstone anticline which was developed in the same direction.

A second but much smaller arch swelled up along a parallel axis on the eastern margin of the district, the remains of which now forms the Roman Camp ridge. Between these two anticlines lies the syncline forming the Midlothian basin. In the northern and western part of the area a series of minor arches and troughs were developed, but these have frequently no visible influence upon the configuration of the district, although by extending the mineral fields over a wide area they may, nevertheless, have far-reaching results upon its development. Two small arches running southwards from Granton and Leith have a con-

[1] "The Igneous Geology of the Bathgate and Linlithgow Hills." By J. D. Falconer, M.A., D.Sc. (*Trans. Roy. Soc. Edin.*, vol. xli.)

siderable influence on the topography of Edinburgh, but it is throughout the shale-fields of the western part of the district that these minor anticlines and intervening troughs are of greatest importance. The Pumpherston anticlinal fold may be traced for several miles, probably as far as Hopetoun House: while in the south-west of the region a syncline extends from Cobbinshaw Reservoir almost to Dalmahoy Hill, and is at one part traversed obliquely by the River Almond.

In addition to the lateral pressure which gave rise to these folds the district was very much faulted. One of the most important of these fractures extends along the south-eastern base of the Pentland Hills as a result of which the valuable mineral-bearing sediments of the Midlothian basin were let down against the old rocks of the Pentland core (Section D). To the west of the Pentlands the region was traversed by an extensive series of faults, the chief of which run in a north-east direction, generally with their downthrow to the north; but in addition to these main lines of fracture, the Ochiltree, the Middleton Hall, the Calder and the Murieston faults, this part of the area is crossed by a very large number of minor faults running in almost every direction which throw the strata into a series of domes, and give to the shale-fields a very complex structure that is of the utmost significance and importance from the mining point of view.

No representatives of rocks belonging to later systems are to be found within the district, but there is evidence that in Permo-carboniferous times volcanic activity was renewed in several localities, notably in the neighbourhood of Arthur's Seat, while several of the intrusions of igneous rock in West Lothian and probably also on the opposite side of the Forth took place at this time.

The Carboniferous period was followed by a vast interval of time during which the area was stripped of many thousand feet of the comparatively soft sedimentary strata by the agents of normal erosion. The first part of the district to undergo this process was the elevated Pentland mass, which at this era, it must be remembered, was covered by Carboniferous rocks to a depth of at least 12,000 feet. But in course of time the bulk, if not the whole of this thick covering, was removed and the more resistant underlying cornstones, basalts, and andesites were left to form an elevated mass above the area that was being steadily lowered on either side. In time this process of denudation went so far that the buried dykes and sills and volcanic necks, more durable than the sedimentary deposits, began to appear as distinct features on the landscape. Moreover, during this long period there was probably time for the development of a mature drainage system throughout the region. But the question of the direction of this Carboniferous drainage system and its relation to that of the present day cannot be investigated here. In discussing the hydrography of the district reference may be made to some of the ancient river courses.

At the end of this long period of denudation the main tectonic features and the broad physical outlines of the district were probably determined, but the area still presented a very rough-hewn mass out of which the details of the surface still remained to be carved, and it was

not until the great ice-sheet had passed across the region that it assumed its present configuration.

While it is almost impossible to estimate how far the surface had been reduced before the advent of the glacial epoch, it is almost as impossible to exaggerate its influence upon the physical character of the region. The rounded form of the hills, due partly to their composition, was intensified; the softer bands intercalated with the successive lava flows and exposed along the strike of the rocks gave way before the ice plough that passed across them; the difference in the powers of resistance of the sedimentary rocks and the igneous masses was the means of the latter becoming still more prominent features in the configuration; the former drainage system was almost entirely obliterated; temporary water courses were established, of which traces still remain in different parts of the district; glacial deposits were widely distributed throughout the area which, besides imposing a certain type of landscape upon the region, have proved of importance to its economic development. On the other hand, the comparative absence from the Pentland district of the cirques or cwms and the truncated spurs which are so typical of certain glaciated regions would seem to suggest that the passage of the *mer de glace* across the area was extremely slow and sluggish; the opposition offered to its advance from the highland area by the southern ice sheet would certainly tend to lessen its rate of movement.

That the lowland part of the district is free from that tameness and monotony of landscape which generally characterises a drift-covered plain is due to the relics of volcanic activity in the various periods preceding the advent of the glacial epoch. The process of disinterring these igneous rocks from beneath their sedimentary covering has reached different stages in different parts of the district. In the Pentland area the removal of the great mass of Carboniferous rocks is now almost complete; elsewhere, throughout the low-lying district, the intrusive dykes and sills and volcanic orifices have been left standing in isolation above the surrounding plain and form conspicuous features in the landscape, especially where, as frequently happens, the volcanic masses are well wooded; in other parts of the region, where similar intrusions have been proved by bores, they still remain buried beneath the sedimentary covering, but while they may exert little influence upon the surface features they frequently are of importance in lessening and sometimes entirely destroying the value for commercial purposes of the formations into which they have been thrust.

It has already been remarked that volcanic activity characterised successive geological periods: within a radius of a few miles it is easy to find examples of different phases of this vulcanicity. The Lower Old Red volcano from which the lavas and tuffs of the Pentland Hills were ejected over a wide area may be taken as an instance of the Vesuvian type, to adopt the classification made by Sir Archibald Geikie in his *Ancient Volcanoes of Great Britain*. The successive lava flows from this volcano now present a remarkable series of escarpments along the northern flanks of the hills. Occasionally the bedded nature of the series corresponds with a slight variation in the vegetation which serves to intensify the

terrace formation of the slopes; for example, on the northern slopes of Warklaw Hill a series of steps can be traced almost from the base to the summit (see also Fig. 2).

Farther to the south-west an example of the fissure type of volcano is supplied by Corston Hill, which still presents a very even skyline, and is in this respect in marked contrast to the very broken outline of the northern part of the Pentlands. This flat-topped ridge, reaching an elevation of about 1150 feet and extending for over a mile, is, according to Sir A. Geikie,[1] a fragment of an ancient Midlothian plateau that stretched across the region from its eastern outliers in Arthur's Seat and the Calton Hill, through Craiglockhart Hill into Lanarkshire where remnants of it can still be traced.

The third type of volcanic action, namely the Puys, is well illustrated in the Carboniferous volcanoes that studded the area to the north and west of the Pentland axis. Of these vents that of Binns Hill is probably the largest, but Tar Hill is an even more interesting example, and is a conspicuous feature in the scenery of the district, forming a broad flat table which stands about 200 feet above the surrounding plain and over 470 feet above sea-level.

Still another phase of volcanic action may be seen in Black Hill, a beautiful dome-shaped hill 1628 feet high, in the heart of the Pentlands. It evidently owes its origin to the intrusion of a mass of igneous material which, however, has been unable to do more than to cause a bulging of the overlying strata, giving rise to a typical laccolite.

The exposure at or near the surface of the intrusive dykes and sills throughout the area to the north and west of the Pentlands accounts for the different type of scenery from that which marks the area to the east where, as has already been noted, volcanic activity appears to have been absent. Dalmahoy Hill, Corstorphine Hill, Mons Hill, the rocks surrounding Dundas Castle, the long swelling ridge to the north of Carlowrie Farm, and the low heights to the north-east of Livingston are all instances of intrusive dykes exposed at the surface by denudation. Sills of hard quartz dolerite have determined the physical features of most of the area lying to the north of the Forth which appears in sheet 32: similar intrusive masses form prominent features in the parishes of Ecclesmachan, Kirknewton, and Ratho (Section B).

Apart from the effects upon the scenery of the district, these volcanic crags and heights have exerted a control upon the historical and economic relations of the region. Because of their commanding situation they were early selected for purposes of defence, and many of the important forts and castles have been erected upon these relics of volcanic action. Niddry, Dundas, and Edinburgh castles are all cases in point. The rock on which the last named stands also furnishes an interesting example of the crag-and-tail formation which played so important a part in the early growth of the capital. The crag-and-tail structure is even better exemplified by the sill at Binny Craig: it presents a precipitous cliff over 200 feet high towards the west, but slopes gently towards the east. Round

[1] *The Ancient Volcanoes of Great Britain*, i. p. 373.

the north, west, and south sides of the base a well-developed channel has been excavated, similar to that which surrounds the Edinburgh Castle rock.

The historical importance of several of the islands in the Forth has already been pointed out, and the close connection between the structure of a country and its historical and economic development has been exemplified in the case of the Forth at Queensferry, where a dolerite sill that runs across the Firth, from Hound Point through Inchgarvie to form the Ferry hills on the Fife side, has given rise to the constriction of the estuary at this point, and has thus indirectly exerted an important

Fig. 3.—The dolerite sill forming the Ferry Hills and Inchgarvie (from North Queensferry).

influence upon Scottish history, and is intimately affecting the place relations of the region at the present time (Fig. 3).

The two deep channels which cut through this sill on either side of Inchgarvie, along with the troughs in the bed of the Firth farther to the east, are among the relics left by the great ice sheet which passed across the region and exerted so profound an influence upon the surface features. Similar grooves are characteristic features on the sky-line of the Riccarton Hills, but their best development is to be seen in the neighbourhood of Edinburgh, where a remarkable series of parallel channels, sometimes connected by smaller overflows, traverse the Braid Hills. The notches that form so conspicuous a feature on the slopes of the Pentlands are another evidence of similar action, although in some cases they may rather be connected with the retreat of the ice.

The ice sheet passed across the region in a direction a little to the

north or south of east according to local circumstances, and has left an authentic record of its progress in the striated rock surfaces to be found in almost every quarter of the district. The striæ are in evidence on the dolerite at present being quarried between Bo'ness and Linlithgow, on the slopes of Corston Hill, and on most of the volcanic eminences already mentioned. The classical example, however, is that in the valley of the Braid Burn on the southern slope of Blackford Hill, where Agassiz, on visiting the place in company with Charles Maclaren in 1840, at once recognised the undercutting of the andesite cliff as the work of an ice sheet. Glacial markings can also be traced on the summit of Allermuir[1] at a height of over 1600 feet, one evidence that the northern end of the Pentlands must have been overridden by a great mass of ice.

The direction of the striæ on the south-eastern side of the Pentland Hills, along with the intercrossing of boulders from the north and the south, would seem to point to the fact that the ice sheet from the southern uplands encroached upon this part of the region in the course of its advance to join the highland *mer de glace*. Erratics are widely distributed throughout the district, and with the exception just referred to, most of the foreign boulders have been transported from the highlands; the origin of some can certainly be located in the Campsie Fells. These erratics abound in the low-lying areas, for example, on the shore on both sides of the Forth, but they are also to be met with at high altitudes in the Pentlands. In some parts of the district, for example, in the neighbourhood of Borthwick and in Ratho parish, they have been utilised for building roads, farm dykes, and drains.

One of the most remarkable examples of a transported boulder was exposed several years ago in a sand-pit at Comiston in the south-west of Edinburgh. A huge boulder of volcanic material, about 30 yards in length and varying from 4 to 12 feet in thickness, was discovered resting horizontally upon a thick mass of stratified sand and gravel of glacial origin (Fig. 4). The rock composing this block is entirely foreign to the immediate neighbourhood, the nearest locality where it is found in place being about two miles to the south-west.

Glacial deposits of sand and gravel have been widely distributed throughout the district. In several places these have been laid down in the form of long ridges forming kames or eskers, which can easily be recognised by their form as well as by the marked change in the character of the vegetation which frequently accompanies them. The kame at Sheriffhall to the north-west of Dalkeith runs in a northerly direction for about a mile; much smaller examples are to be found near Campend, at Arniston, in the neighbourhood of Loanhead and Lasswade, and at Mortonhall, not far from the pit at Comiston.

But much more important are the tracts of fluvio-glacial and glacial deposits which cover several square miles of the district. The distribu-

[1] "On the Glaciated Summit of Allermuir, Pentlands." J. Bennie. (*Proc. Roy. Phys. Soc. Edin.*, vol. vii. p. 307.)

tion of these deposits and their relation to the configuration of the region is significant. Small patches are to be found scattered over the plain to the west of the Pentlands, for example, between Binns Hill and the eastern slopes of the Linlithgow Hills, in the neighbourhood of Livingston and to the west of Kaimes Hill (see Geological Map), but it is on the flanks of the Pentlands, and especially on the slopes enclosing the Midlothian basin that they reach their greatest extent. It is possible to trace a belt of these deposits from Liberton as far as Nine Mile Burn, which is interrupted only in a very few places; they are continued in an easterly direction through the parishes of Carrington and Borthwick, along the slopes enclosing the Midlothian basin on the south, and here they form a remarkable terrace between the 700 and 500 feet contours. While these deposits cover a considerable tract on the floor of this basin they are notably absent from the western slopes of the Roman Camp ridge. The distribution of these deposits and their composition and appearance in the field make it most probable that they are connected with the retreat of the ice sheet from the region, and were laid down in temporary lakes dammed up by the retreating ice or as gravel spreads between the free slopes of the hills and the ice front. Similar phenomena occur to the east of the Roman Camp ridge along the northern slopes of the Lammermuir Hills. Professor Kendall and Mr. E. B. Bailey have made a detailed examination of the East Lothian deposits,[1] and there can be little doubt that the explanation which they suggest for them is applicable with certain modifications to the deposits of Midlothian. Besides throwing considerable light on the physical history of the region, these glacial sands and gravels have aided its economic development; in some cases they have been utilised to furnish a water supply for several of the communities in the basin of the Esk, while the number of pits that have been opened up, especially within Carrington parish, shows that they have been of service for other purposes.

Much more extensive and perhaps more important than these deposits is the great mass of boulder clay under which the region has been buried as a result of the passing of the ice sheet across it. This drift has been discovered at great depths in the channel of the Forth; patches of it are present on the highest hills; along Breich water, at the western extremity of the region its depth is at least 100 feet, and at Portobello it is no less thick. At Silvermine in the south, at Charleston and other places on the north side of the Forth, on the shore at Granton and at Borthwick in the extreme south-east of the district this boulder clay is everywhere prevalent. Perhaps the most interesting exposure is that at Hailes Quarry, where a layer of peat over a foot in thickness is intercalated between deposits of boulder clay. The presence of this organic matter would seem to point to the

[1] "The Glaciation of East Lothian South of the Garlton Hills." (*Trans. Roy. Soc. Edin.*, vol. xlvi. part 1.) Also "The Glacier Lakes of Cleveland." P. F. Kendall, F.G.S. (*Proc. Yorkshire Geological and Polytechnic Society*, vol. xv.)

fact that after the deposition of the lower bed of drift the ice sheet retreated from this part, and for a time conditions prevailed which made possible the development of plant life, first of an Arctic and then of a more temperate species. Later the glacial conditions were re-established and the upper bed of boulder clay was laid down above the decayed vegetation of milder times.

The widespread deposition of this boulder clay throughout the district, varying in colour and texture in various places according to the nature of the rock over which the ice has passed, has produced a gently undulating type of surface, broken only by the rise of the volcanic rocks to which reference has already been made. Besides affecting the character of the soil and its utility for agricultural purposes, the boulder clay has also been utilised for various industrial purposes which will be referred to later.

When the ice sheet retreated from the district there remained scattered throughout the area a number of hollows or basins which had either been scooped out of the hard rock or had been formed by the irregular deposition of the drift. Long after a normal drainage system had been established in post-glacial times and the marshy conditions which resulted from the melting of the ice had disappeared, these hollows formed extensive lakes in several localities throughout the region. A considerable number of these formerly existed in the neighbourhood of Edinburgh. In their paper upon *The Ancient Lakes of Edinburgh* Messrs. Bennie and Scott enumerated nine sheets of water within the bounds of the city or its immediate vicinity. The most extensive of these ancient lakes stretched from Haymarket at the western end of the city as far as Corstorphine, where it was separated from another sheet of water that extended still further westwards to Gogar. Gradually, however, these lakes have been silted up or were artificially drained. The Gogar Loch was drained about the middle of the eighteenth century. The draining of the Burgh Loch, which is now covered by the Meadows in Edinburgh, was begun in 1722. It appears that Corstorphine Loch was partly drained and reclaimed as early as 1670, but for many years after that date much of it still remained a marsh, and tradition has it that a light used to be kept burning in the church at Corstorphine to guide unwary travellers across it by night. The site of the ancient lakes of Corstorphine and Gogar is now covered by a wide fertile alluvial tract, occupied by nurseries, market gardens and farms, and traversed throughout by a long level railway track. Remnants of some of the other lakes still remain in the pool at Craigcrook, at Lochend and at Duddingston, where, however, this picturesque sheet of water is being rapidly silted up.

Since the paper by Messrs. Scott and Bennie[1] was written the subject of the ancient lakes has received the attention of Mr. Cadell,[2] who has been able to accumulate much valuable evidence as to their distribution, and the conditions under which they existed, and when

[1] *Proc. Roy. Phys. Soc. Edin.*, vol. x. p. 126.

[2] *Scot. Geog. Mag.*, vol. ix. p. 302. "Some Ancient Landmarks of Midlothian."

the results of his latest research are published they will throw much fresh light upon a very interesting phase of the physical history and development of the district.

Hydrography.

Even the most casual examination of the map showing the rivers of the district reveals the complicated nature of the drainage system. None of the streams of the region attain any considerable size, none of them are navigable, and many represented on the map are little more than tiny burns, which are often completely dry at certain seasons of the year; but they do much to reveal the past history of the region, and they suggest many important problems, to only a few of which reference can be made here. The district includes three distinct drainage basins, the Almond, the Water of Leith, and the Esk. The dominant direction of the main streams, all of which are tributaries of the Forth, is north-east, except in the case of the South Esk, which maintains a more northerly course until it unites with its companion stream at Dalkeith.

The Almond takes its rise in the Lanarkshire parish of Shotts at an elevation of 850 feet, and after a course of fourteen miles it enters the Edinburgh district about a mile north of Addiewell, where it gradually assumes a north-easterly direction. Before reaching Livingston it is joined by the Breich Water, a stream of greater volume than its own; between this point and Midcalder it receives the waters of West Calder Burn, Harwood Burn, Murieston Water, and Crosswood Burn, all of which have their source in the bleak moorland lying in the south-west of the region and within a very short distance of the headwaters of the Medwin streams which make their way southwards to the Clyde. In the Brox Burn and Niddrie Burn it receives some of the drainage of the Linlithgow Hills. After passing Kirkliston, the Almond winds across a wide flat floor covered with glacial sand and gravel, above which the stream has deposited a thin layer of alluvium. At its eastern end there extends an elevated mass of dolerite through which the stream has had to cut a deep gorge in order to reach the Firth. It is probable that this gorge may have been cut within post-glacial times; it has now been fairly well established by the large number of bores that have been sunk in the vicinity that the preglacial stream followed a somewhat different, though roughly parallel, course. An old channel, which probably marks the course of the former river can be traced for a considerable distance from Midcalder through Clapperton Hall, Almondell, and across the corner of Drumshoreland wood on to Carlowrie. Mr. Cadell is of the opinion that the preglacial river must have passed close to the site of Dalmeny House on its way to join the main stream, which at that time occupied a channel much farther to the north of the modern shoreline, for only at this point on the coast is there any break in the rock which could possibly have formed part of a former valley. But the point of greatest interest is that these bores indicate that in former times the land stood at a much higher level above the sea than at present. A steep-sided gorge

has been proved to underlie the present bed of the Forth to a great depth. This preglacial river course is now choked with boulder clay, and this fact is of the utmost importance when considering the possibility of working the under-sea coal, which is known to underlie the bed of the river and the firth.

The course of the Water of Leith throws even greater light than that of the Almond upon the physical history of the district. This stream takes its rise on the slopes between West Cairn and Colzium Hill at a height of 1300 feet, in various burns which are collected in Harperrig Reservoir. On emerging from this sheet of water the stream flows for about two miles in a NNE. direction towards a long low ridge which runs parallel to the slopes of the Pentland Hills, and along the crest of which runs the old Lanark road. On its northern side this ridge slopes steadily down to the plain beyond. Instead of continuing its NNE. direction across this ridge, and thus following what appears to be the most natural course to the lowland, the Water of Leith, still an insignificant stream, bends slightly to the east, and maintains its course for several miles between the Pentlands and the low ridge on its left bank. In passing, reference may be made to the series of river terraces which the stream has cut in a thick deposit of glacial drift. The highest terrace is about thirty feet below the bank of the stream; a few feet lower a second terrace has been cut, marking another stage in its history: about five feet below this second terrace is the present flood plain.

On reaching Colinton village the stream sets itself to work its way across the ridge that has confined it for so many miles, and reaches the open plain near Slateford, through a deep gorge. Between this point and Harperrig Reservoir, the Water of Leith does not receive a single tributary on its left bank; all its side streams, the most important being Bavelaw Burn, which also follows a somewhat anomalous course at one stage, have their source in the Pentland Hills: the ridge along the left bank of the Water of Leith is far too small to form a catchment basin for the development of tributary streams. Before reaching the outskirts of Edinburgh the Water of Leith is joined by the Murray Burn and by a small stream flowing from the west through Corstorphine. Before entering the sea at Leith the stream has cut another deep gorge across an anticline that extends from Leith through the western part of Edinburgh. Above the steep slopes of this picturesque valley, commanding a wide view over the Firth of Forth, have been built some of the most imposing dwelling-houses in the capital (Fig. 5).

A clue to the unusual course which the stream has followed is furnished by the glacial deposits of its upper course. In the vicinity of the railway tunnel at Colinton, Mr. J. Henderson[1] observed a mass of boulder clay, ten feet in thickness, resting upon the truncated edges of rocks of carboniferous age, which are overlain by a layer of river gravel. This glacial material slopes towards the stream, and on its upper surface there lies another thin layer of river gravel which can be followed from the top of the clay down to the present bed of the stream by which

[1] *Trans. Edin. Geol. Soc.*, vol. ii. p. 196.

Fig. 4. -Volcanic boulder resting on stratified sand and gravel, Comiston, Edinburgh.

Fig. 5.—The gorge of the Water of Leith from the Dean Bridge.

Fig. 7.—The Braid Burn excavating its pre-glacial channel.

it had evidently been deposited. Thus the present river has been cutting its way not through solid rocks but through the glacial deposits that have choked a former channel. (Fig. 6.) After the retreat of the ice sheet from the area, a fresh drainage system was inaugurated, and it would appear that the preglacial and postglacial surfaces corresponded sufficiently to give a similar direction to the new stream, which therefore followed the lines of the former stream, and has succeeded in establishing itself along part of the ancient channel. But a short distance below the tunnel at Colinton the character of the gorge changes to some extent, and all traces of glacial deposits disappear; the stream is evidently no longer following the ancient channel, and has cut a gorge of its own across the ridge to which it has been flowing parallel for several miles. Mr. Henderson was able to trace this deserted channel for some distance. It seems probable that from Colinton the ancient stream flowed along a valley between Craiglockhart Hill and the Pentlands, and, after skirting the Blackford Hill on its northern side, entered the sea near Portobello. But to establish this theory the records of many more bores

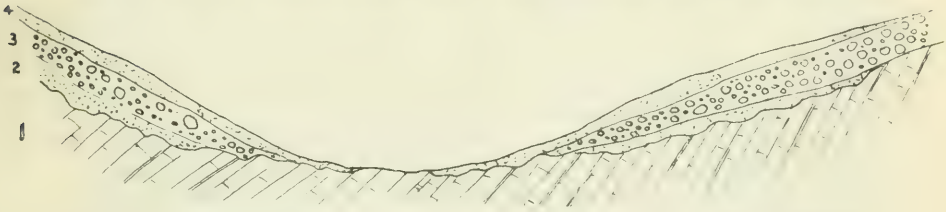


FIG. 6.—Section of the course of the Water of Leith above Colinton. *After J. Henderson.*

1. Carboniferous rocks. 2. Old river gravel. 3. Boulder clay. 4. Present river gravel.

would be necessary than we at present possess, for of course the configuration of the present surface can throw little light upon these ancient conditions. It is not impossible, however, that the former Water of Leith may have had some connection with the preglacial Braid Burn.

The Braid Burn furnishes perhaps the best example within the district of a stream reinserting its course along a preglacial channel. Before the advent of the ice age this ancient stream had succeeded in cutting a deep channel through a mass of tough volcanic rocks, severing it into two parts which now form the Blackford and Braid Hills. That the valley had attained something like its present depth before the passing of the ice sheet along it is suggested by the striæ in the bottom of the valley and the undercutting of the andesitic cliff which has already been referred to, as well as the deposits of drift that still remain upon the slopes. As a result of the passing of the great mass of ice along it, the channel became choked with glacial drift, and the former line of drainage was entirely obliterated. But when normal conditions were again established a stream, the present Braid Burn, was gradually reinstated along the old channel by the removal of the boulder clay which filled it (Fig. 7), and so completely has the tiny stream accomplished the work of scouring out the old channel that few traces of the drift remain.

Two streams, the Henshaw Burn and the Gutterford Burn, rising at an elevation of about 1500 feet and flowing in a southerly direction into a small reservoir on the south-eastern side of the Pentlands, form the headwaters of the North Esk. On leaving the reservoir the stream continues its south-easterly course for some distance across an area of the oldest strata in the region. It may be mentioned in passing that the stream here forms the boundary line between Midlothian and the adjoining county of Peebles. The most natural course would have been for the stream to continue its south-easterly line in accordance with the slope of the land, but in the vicinity of the Carlops (which does not appear on the present sheet) an easterly and then a north-easterly direction is imposed upon the stream, which for a time seems to run in the direction of the contours, under the influence of a long mound of glacial deposits that flanks the slopes. Before reaching Penicuik the North Esk is joined on the left bank by Monks Burn, Walston Burn, Cornton Burn, Quarrel Burn, and Silver Burn, all flowing from the south-east slopes of the Pentlands and, with the possible exception of Walston Burn, evidently quite unaffected in their course by the great Pentland fault which they cross at right angles. Below Penicuik the North Esk receives the waters of Glencorse Burn, which flows from the north-west margin of the Pentlands through a wide transverse valley, and of Bilston Burn flowing from the slopes of Allermuir.

At Dalkeith the North Esk unites with the south branch which takes its rise on the slopes of Blackhope Scar, one of the Moorfoot Hills, and brings down with it the waters of Fullarton Water, Dalhousie Burn and Gore Water. Throughout their course both streams furnish excellent illustrations of the various stages of river development, from the gully incised on the hillside, the deep gorges, the wide open valleys, the ancient river terrace with its imbedded drifted trees,[1] the broad flood plain, to the small delta that is being formed at the mouth. Attention has frequently been called to the sudden changes that take place in the character of the Esk. After flowing for some distance between gently sloping banks, usually under cultivation and suggesting a drift-covered area, the stream suddenly plunges into a deep narrow gorge with almost precipitous sides of bare rock. The explanation of this sudden change in the character of the stream is probably that the stream is flowing now along a former channel which it has re-excavated, and now along a new gorge which it has cut for itself since the retreat of the ice sheet, and the restoration of a normal drainage system. Some idea as to how the stream has been able to erode its channel within that time is afforded at many points between Roslin and Hawthornden, where it is possible to trace the marks made on its banks by the stream when it was cutting its channel. At one point a remarkable series of notches such as would be caused by running water laden with material can be traced on the sides of the steep banks at a height of forty to fifty feet above the present bed of the stream.

[1] "Notes on the Occurrence of Drifted Trees in Beds of Sand and Gravel at Musselburgh." Prof. J. Geikie. (*Proc. Roy. Soc. Edin.*, vol. xii. p. 745.)

Both branches of the Esk provide many examples of different types of river meanders. One of the most interesting is found on the North Esk between Hawthornden Castle and Polton. At this point the stream has been compelled to turn back upon itself and accordingly to drop the bulk of its load, which is spread over the bed of the stream. After flowing for about 300 yards in the reverse direction, namely south, the stream bends round to the east, and after another quarter of a mile it turns north-west, and soon resumes its first direction within about 250 yards of the point at which the stream was diverted, and compelled to make an elaborate dovetailed meander. (Fig. 8.) The course of the stream is here interrupted by a high ridge of glacial sand and gravel and of boulder clay which projects right across the stream. This glacial material may occupy an old channel, but now not only has it caused the Esk to alter its course and to erode a channel through the more friable Roslin sandstone, but it has apparently pushed the junction of the Bilston Burn and the Esk about half a mile downstream.

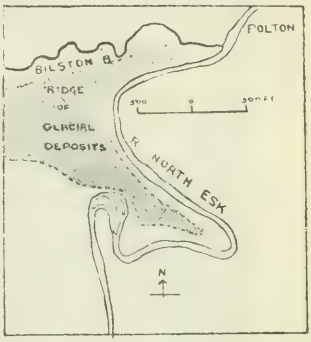


FIG. 8.—The Esk near Polton.

Mention has been made of the transverse valley through which the Glencorse Burn flows from its source on the north-west margin of the Pentlands to join the Esk on the south-east side of the hills. Such valleys are a marked feature of the Pentland area, but they are much more mature than the streams which now occupy them. It seems probable that they are in the first instance the product of the preglacial rivers which, with a wide catchment basin to the north-west, acted as the chief agent in the removal of the great mass of the Carboniferous strata that formerly overlay the Pentland area, and in the evolution of a low-land on either side of the more resistant Pentland mass. But with the development of this low-lying area a drainage system was established with a north-east trend, which eventually beheaded and truncated the streams that formerly flowed across the region to the south-east. Thus the Esk has captured the streams on the south-east side of the Pentlands at one end and the Medwin at the other. The Lyne alone of all these south-east streams has been able to maintain its course and to join the Tweed, although some of the headwaters of the North Esk are separated from it only by a comparatively low and narrow divide. On the opposite side of the Pentlands the Almond and the Water of Leith have entirely captured the remnant streams of the earlier drainage system.

The passes which cross the Pentlands, however, owe much of their present outline to the intense but slow glacial action to which they were subjected during the ice age. One of the most interesting results of this action is to be seen in the upper part of the Glencorse valley, above Loganlee Reservoir. A very small burn flows through the valley between Hare Hill and Black Hill which here trends slightly to the south-

east; in less than a mile from its source, in a flat marshy tract between the two hills, the stream is joined by the Logan Burn, which has been flowing from the south-west for about two miles, and brings with it a greater volume of water than that of the tiny burn into which it falls.

Fig. 9.—The ice-deepened valley above Loganlee. The Logan Burn enters by a hanging valley on the right of the picture; on the opposite side part of a corrom may be seen.

There seems little doubt that the Logan Burn formerly entered the main valley at even grade, but as a result of the passing of the ice sheet along it, this valley has been much deepened: while the channel of the Logan Burn, which runs transverse to the direction of the ice sheet, remained comparatively unaffected by it, and now forms a hanging valley above the floor of the main valley, similar but on a much smaller scale to the

phenomenon in the valley of the Ticino, to which Professor W. M. Davis [1] has called attention as conclusive evidence of glacial erosion. On the other side of the valley, opposite the Loganlee Waterfall, a small torrent which rushes down the steep slope of Black Hill has deposited a large mass of material on the floor of the main valley, which the tiny stream trickling through it has been unable to carry away, so that it forms a typical corrom. The cone has pushed the channel of the stream towards the opposite side of the valley, and it also forms a watershed whereby the water rushing down the hillside is made to enter the burn in the valley now upstream and now downstream. Part of this corrom appears in the left corner of Fig. 9. Another cone forms the watershed higher up the valley from which the streams flow northwards to Bavelaw and south to Loganlee.

From the amount of gravel and sand to be found along the broad

Fig. 10.—The dry valley running through Shewington Farm.

valley floor from Bavelaw to Loganlee and Glencorse it seems as if this valley formed a channel of escape for the melt waters of the retreating ice sheet while it still covered the lower slopes of the hills. Closely connected also with the retreat of the ice sheet from the district are several remarkable east to west valleys which run parallel to the contour lines through the parish of Carrington. The largest of these channels runs from the station at Rosslynlee, through the farms of Broachrigg and Barleydean to Stonefield Hill, a distance of about three miles. Its low grade and the character of its slopes suggest that this channel is the work of a considerable volume of water, but with the exception of the ditches constructed for drainage purposes the valley is quite dry. The only stream in the vicinity is the Dalhousie Burn and this cuts across the dry channel at right angles and is entirely unaffected by it. A similar channel extends from the County Asylum at Rosewell through

[1] *Glacial Erosion in the Valley of the Ticino*, W. M. Davis. Appalachia, ix. pp. 136-156.

Newbigging and Shewington to Redside (Fig. 10). The small burn which carries off the rainwash from the slopes opposite Shewington Farm can have had no part in excavating the wide channel through which it flows towards Stonefield Hill, but it serves to reveal the glacial character of the deposits on the floor of the valley. Several small boulders in the sand and gravel display distinct glacial markings. A third but smaller channel runs parallel to the 500-feet contour line. It would appear that these valleys mark successive halting-points in the retreat of the ice sheet from the hill slopes. The melt waters, unable to reach the sea because of the ice which still covered the lower parts of the district, formed marginal lakes connected by temporary drainage channels between the hill slopes and the ice front. And it is to such conditions that the deposits of sand and gravel to which attention has been called, as well as the present channels, owe their origin. With the farther retreat of the ice sheet and the opening up of the lower ground a normal drainage system was established and the channels along the hill slopes were deserted.

A still more remarkable example of a dry valley occurs in the extreme south-east corner of the district. The Middleton North Burn, after following a north-easterly course practically throughout its entire length (Fig. 11), is joined by the Middleton South Burn at Borthwick village. The latter stream follows the same direction for several miles from its source on the slopes of the Moorfoots, but about half a mile before it joins the North Burn the stream makes a sharp bend at right angles to its former course. The combined streams then continue to flow north-west through a narrow gap in the long low ridge on which the village stands, and to which the North Burn runs parallel. The stream now forms the Gore Water and maintains its north-west direction until it falls into the South Esk at Kirkhill. But from the junction of the two streams at Borthwick a broad mature valley runs for almost a mile to the north-east, continuing the direction of the Middleton North Burn, and opens into the broad valley of the Tyne Water near the ruins of Crichton Castle (Fig. 12). This continuation valley has gentle slopes and a broad flat floor which, at its highest point, within a few yards of the stream at Borthwick, is not more than 12 feet above the present bed of the burn ; from this point to the junction with the Tyne valley, a distance of 1600 yards, its fall is less than 100 feet, indicating a very slight gradient. About 500 yards to the north-east of Borthwick an artificial embankment, about 250 yards in length from one side to the other, carries the line of the North British Railway across the valley, which is here about 50 yards in depth.

From the form of the valley it is quite clear that its present configuration is the work of a stream of great volume but the valley is now entirely devoid of water, except that which is brought down by a very young stream, less than a mile in length and with every appearance of being an artificial cut, which enters the valley on the left slope about a quarter of a mile from the junction with the Tyne Water. Much of the material brought down by this burn lies in disorder on the floor of the valley and there is no suggestion that it had any part in forming the

Fig. 12.—The Borthwick Dry Valley (crossed by a line of trees) at its junction with the broad valley of the Tyne Water. The railway embankment of smouldering ashes appears in the background, and cuts off the view of the village of Borthwick.

Fig. 13.—Borthwick village and the Gore Water from the NW. Immediately behind the church and the castle is the valley of Middleton North Burn; to the left of the castle is the gap in the ridge cut by the Gore Water.

wide channel by which it reaches the Tyne. The Tyne itself at this

FIG. 11.—Map showing the Borthwick dry valley.

point is a very insignificant stream and out of all proportion to its broad, flat-floored, and gently graded valley. The Tyne and the Borthwick valley evidently owe their present form to the conditions

which prevailed during the retreat of the ice sheet from the higher parts of the area, when they formed one of the main channels of escape to the large volume of water that was set free over a very extensive area by the melting of the ice, but which was unable to reach the low ground because of the remnant of the *mer de glace* which still occupied it. Thus much of the Midlothian drainage was diverted to the Tyne in this way. But even when the ice had disappeared from the district and a normal drainage system had been established there seems every likelihood that the Middleton Burns continued to form the headwaters of the Tyne. Since then, however, the Gore Water has worked its way back, and, by cutting a gap in the low ridge which separated its basin from the Middleton North Burn, has succeeded in capturing these streams, and in carrying off to the Esk the water which formerly found its way to the Tyne by the Borthwick valley (Fig. 13).

Reference may be made to one or two minor points in the river system of the district which might repay investigation by throwing some light on earlier physical conditions, for example, the course of the Walston Burn which runs for some distance parallel to the contour lines, probably owing to the presence of a low morainic mound which confines it; but it is also possible that the Pentland Fault may have had some influence in determining its course; the course of the Bavelaw Burn in its relation to the Water of Leith; and the sudden change in the direction of Gogar Burn before entering Gogar Park, at which point it is separated only by a very slight elevation from the drainage basin of the Water of Leith.

With the exception of the relics of ancient glacial lakes to which attention has been called, there are no important natural sheets of water within the district, but in order to furnish a water supply for the capital and the surrounding area a number of reservoirs have been constructed to store the copious rainfall of the Pentland area. From this source an average of seven million gallons per day can be obtained, and the water has the peculiar quality of rendering filtration unnecessary. But even this amount is not equal to the demands of a growing population, and a larger and more constant supply is now obtained from the Talla area, which, however, lies outside the district under consideration.

(*To be continued.*)

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

The Annual Business Meeting.

This will be held in the Society's Rooms, Synod Hall, Castle Terrace, Edinburgh, on Tuesday, the 7th November 1911, at 3.30 P.M.

The Right Hon. the Earl of Stair, President of the Society, will preside.

Presentation of Professor Geikie's Portrait.

The portrait of Professor Geikie, subscribed for by members of the Royal Scottish Geographical Society, will be unveiled by the President at this meeting. A replica of the portrait will also be presented to Mrs. Geikie.

Lectures in November.

The Society's anniversary address will be delivered by Dr. Fridtjof Nansen, G.C.M.G., in the Synod Hall, Edinburgh, on the 9th November. The subject of his lecture will be "The Norsemen in America."

Dr. Nansen will repeat his address before the Glasgow Centre on November the 10th.

Lt.-Col. the Hon. Sir Newton James Moore, K.C.M.G., C.M.G., J.P., Agent-General for Australia, will open the Aberdeen and Dundee Centres on the 7th and 8th November respectively. The title of his lecture in Aberdeen will be "A British State in the Making," and in Dundee "How the Plan of Empire is Filled in."

Captain C. G. Rawling, F.R.G.S., will address the Edinburgh and Glasgow Centres on his "Explorations in New Guinea" on the 21st and 22nd November respectively.

Mr. J. A. J. de Villiers, superintendent of the Map Room of the British Museum and honorary secretary of the Hakluyt Society, will deliver lectures to the Dundee and Aberdeen Centres on the 23rd and 24th November. The subject of his lectures will be "The Rise of British Guiana."

GEOGRAPHICAL NOTES.

Europe.

The Pre-History of Wales.—In an address with this title, delivered to the Cambrian Archæological Association at Abergele, during the past summer, Prof. W. Boyd Dawkins discussed the early races of Wales. He said that at the time when the Neolithic aborigines first found their way so far west in the British Islands as Wales, the whole land was covered with forest, the lower portions of the valleys were filled with morasses, and the only tracks were those of wild animals. The land was some 60 feet above its present level, and the coastline included the area of Anglesea. The Neolithic farmers were a small oval-headed people, well formed, and had been clearly proved to be identical with the Iberian peoples of history. They were represented to-day by the small, dark element in the Welsh population. The next elements in the Welsh population were the taller broad-headed people, who lived in Wales in the Bronze Age. Their civilisation was derived from the continent, and they were identified with the earlier division of the Celtic peoples, the Goidels, termed by Rhys the Q Celts. In the prehistoric Iron Age a new civilisation made its appearance. That, too, was probably introduced by invading tribes from the continent, and these belonged to the

Brythons, or P Celts of Rhys. These represented the third element, and no new traceable element was added by the Roman occupation.

America.

The Galapagos Islands.—In our last issue, on p. 547, we quoted from an American paper the statement that the Galapagos Islands had been sold by the Republic of Ecuador to the Government of the United States. We are, however, officially informed by the Consul General of the former Republic that the statement is erroneous, and that the Archipelago remains the property of Ecuador.

Polar.

The Plant Life of Hare Island.—Prof. Morten P. Porsild, of the Danish Arctic Station on Disco Island, has published a pamphlet on his investigations of the flora of Hare Island, which lies to the north-west of Disco. The island is uninhabited, and measures some 66 square miles in extent. The shortest distance to the coast of Disco is 6 miles, and to that of the peninsula of Nugsuak about 12 miles. Vegetation on the island is scanty, but Mr. Porsild has found 112 species of vascular plants. Of these 73·3 per cent. may be described as northern or Arctic, while 26·9 per cent. are of more southern type, and may be described as hemi-arctic. As compared with Disco this latter element is poorly developed, for some fifty species find their northern limit in Disco. All these southern types, so far as at present known, ripen their fruits and seeds late in the autumn, and only occur in spots which are thickly covered with snow in winter. This fact prevents transportation of the fruits or seeds by wind, and as the stations where these plants occur are separated from each other by long tracts of unsuitable ground, any form of migration is impossible to such plants. Their presence therefore in small numbers in Hare Island, and in larger numbers on Disco, must be the result of the fact that they are relics of a time when the post-glacial climate was milder than at present.

In addition to the absence of these plants of southern type in Hare Island, its flora is remarkable in the absence of over thirty species which occur on the adjacent coasts of Disco and Nugsuak. No difference of climate or topography can be invoked to explain this fact, and Mr. Porsild considers that it is due to the peculiar methods of plant distribution which obtain in the Arctic. The most important factor in this distribution is the agency of wind in carrying seeds in winter over hardened snow and frozen water. But the straits separating Hare Island from the adjacent land masses are rarely completely frozen over, even in the severest winter. The result is that the snow from the mainland with its load of seeds is swept into the water, and the plants are thus prevented from gaining a foothold on Hare Island.

General.

Glacial Erosion.—In No. 3 of the current volume of the *Journal of Geology*, Messrs. T. C. and R. C. Chamberlin return to the much-discussed

subject of glacial erosion, basing their remarks especially upon Prof. Bonney's Address to the British Association, which we published here last autumn (vol. xxvi. p. 505), and upon Prof. Garwood's article in the September issue of the *Geographical Journal* last year.

The substance of the article is made up by detailed discussions of particular cases, and is illustrated by some fine photograpbs taken especially in the Alps and Norway. The general conclusion arrived at is that where conditions favour glacial erosion ice proves a more powerful denuding agent than water. But this does not make the superiority of the former "universal and unqualified." The authors so far accept Prof. Garwood's views that they admit that snowfields in the "passive state" serve as protective agencies, and they believe also that the above statement does not "exclude the view that the centre of a continental ice-field, from which the motion is mainly radiant and limited in amount, may be protective rather than erosive when compared with normal weathering. Nor does it exclude the view that valley glaciers in some of their parts may be less erosive than normal wear and weathering would be. But these seem to us rather qualifications of the general proposition that glaciers are effective agents of erosion than contraventions of it."

Another article on the same subject has been published recently by Prof. Emm. de Martonne in the *Annales de Géographie*, and is reprinted as a pamphlet under the title of *L'Erosion glaciaire et la Formation des Vallées Alpines*. This pamphlet also is beautifully illustrated. We cannot here summarise fully Prof. de Martonne's position, but may indicate that he believes the present form of the Alpine valleys to be due to the effect of the glaciers acting upon a surface which showed traces of two cycles of fluviatile erosion. Earth movements at the end of the Tertiary, he believes, resulted in extensive Quaternary erosion, during which the great valleys were hollowed out to depths exceeding 1200 feet. Rejuvernation of the river courses then took place, and glacial erosion was later superimposed upon a combination of young and mature relief. The extension and diminution of the glaciers in successive periods exposed the valleys alternately to glacial and stream erosion, and the present peculiarities of the valleys are due to a combination of these causes.

The Tenth International Geographical Congress. — In a circular dated 25th September, it was announced that this Congress, which was to open on 15th October, had been postponed "for some months," and will meet at some date in the coming spring. The announcement, made at so late a date, aroused considerable disappointment, especially as the reason given, that many members had declared the month of October unsuitable, and "several" had asked for a postponement, seemed unsatisfactory when all the preparations were so far advanced. It is to be noted, however, that the Geographical Congress shared the same fate as a number of other International Congresses, which were to be held in Rome this autumn, but were postponed.

Commercial Geography.

The African Palm-Oil Industry.—On p. 379 of vol. xxvi. we gave

some account of this industry, and explained how it was handicapped by the wasteful methods of oil extraction practised by the natives. According to an account in the *Times*, there are now on the market several machines capable of extracting the oil to within about 2 per cent. of the total quantity, which is equivalent to obtaining about 22 per cent. of palm oil from the palm fruit. These machines are capable of dealing with very large quantities, and it is probable that the next few years will see a large number of them set to work and many factories established in West Africa, not only for extracting the palm oil, but for shelling the nuts and obtaining the kernel oil, which has up to now been almost exclusively done in Europe. Owing to the many varieties of the fruit and nuts and to inequalities in size and construction, it is not easy to guarantee that all the kernels will be obtained, but machines can usually be relied upon to yield 95 per cent. of the total amount of kernels in the nuts in a state ready for the extraction of oil.

The palm fruit cannot economically be gathered all the year round, but only during about seven months out of twelve, the time varying slightly in different districts. It is quite useless to store the freshly-gathered fruit, and in this way keep the machinery fully occupied, as it must be treated within a few days of being taken from the tree, otherwise the oil is of little value. The nuts can, however, be stored for almost any length of time, so that it is economical to keep the plant at work on the production of the palm oil during the whole of the gathering period, and house the nuts until no more fruit is available, when the same plant may be employed for the extraction of the palm oil, the nut-cracking machines then being the only portion of the plant which is not working continuously throughout the year.

The only bar to the widespread development of the palm-oil industry in West Africa at the present time is the difficulty of transport from some of the best palm districts, and this will not be overcome until much of the country is opened up, in which, however, steady progress is being made. But there are very large palm-bearing areas not far from the coast, and on the verge of wide navigable rivers, where the question of transporting the oil for shipment involves no great difficulty or expense, and it is in these districts that the first steps will be taken on a large scale. When it is remembered that the palm-oil will fetch about £30 per ton in Europe at the present time, and that on a moderately large scale it could be delivered in Liverpool for under £15 per ton, including absolutely all charges, it is not difficult to understand that future developments may be rapid and have an important bearing on the general prospects of the West Coast.

EDUCATIONAL.

Geography in Glasgow University.—Dr. J. D. Falconer, M.A., late principal officer of the Mineral Survey of Northern Nigeria, and formerly assistant to Professor James Geikie, has been appointed to the lectureship in Geography in Glasgow University, rendered vacant by

the resignation of Captain Lyons, F.R.S. Dr. Falconer's book on *The Geology and Geography of Northern Nigeria* was reviewed in the last issue of the *Magazine* (p. 554).

It is also announced that His Majesty in Council has approved a new Ordinance whereby Geography is added to the subjects which may be offered in the final examination for the B.Sc. degree at Glasgow University.

A University Geographical Society.—We have received a copy of the first issue of the *Mitteilungen des Vereins der Geographen an der Universität Leipzig*, which contains an account of the founding of the "Geographical Union" at this University. It is pointed out in the preface that geography early obtained a footing at Leipzig University, and has been fortunate in its professors, for the roll contains such famous names as those of Peschel, Richthofen, and Ratzel. The last-named, in addition to his literary work and his teaching, took a great interest in the Geographical Seminar, which became very active during his professorship. When, after the sudden death of Ratzel in 1904, Professor Partsch took his place, the geographical faculty continued to develop and to show great activity. Last year a desire began to express itself among the students that an organisation should be founded to promote the further study of geography among themselves, and this led ultimately to the establishment, in January 1911, of a students' society, which has since held various meetings, and now publishes its *Transactions*.

This first issue is dedicated to Professor Partsch as a *Festschrift* on the occasion of his sixtieth birthday, and contains an account of an excursion undertaken by the Geographical Seminar, a geographical account of the city of Leipzig, as well as a considerable number of other papers.

A Geographical Exercise Book.—Messrs. W. and A. K. Johnston have published a *Scholar's Geographical Exercise Book* (see under *New Maps*) which includes a number of sheets of squared paper to be used for graphic records, and also outline maps of the principal countries of the world, and of the world on Mollweide's and Mercator's projections. These outline maps are intended to be used for illustrating the geography lessons, and for the construction of maps showing rainfall, productions, means of communication, and so forth. Teachers who are in the habit of making their scholars carry out such exercises will doubtless find it a convenience to have a number of sketch-maps available for the purpose under one cover, while the squared paper will be found very useful for accessory diagrams.

Review of the Trade of India.—Teachers may be glad to have brought before their notice the fact that the *Review of the Trade of India in* 1909-10 (1911) is now lying in the library. This report contains a great mass of facts which may be used to give vividness to lessons on this great tropical dependency, and is moreover illustrated by a useful sketch-map showing the chief products of the country, and the railway routes. The text contains too great a mass of detail to be dealt with

by means of an abstract, but many points of considerable geographical interest can be extracted from it.

NEW BOOKS.

EUROPE.

A Geography of Ireland. By O. J. R. Howarth. The Oxford Geographies Edited by A. J. Herbertson. Oxford: At the Clarendon Press, 1911. *Price* 2*s.* 6*d.*

This is a valuable member of the series of Oxford Geographies, and is copiously illustrated by sketch-maps and some excellent photographs. It is divided into three parts:—(1) General Physical and Biological Features, (2) Regional Description, (3) Human Geography. Mr. Howarth's style is clear and simple, and the book is interesting and attractively got up. The only criticism that we have to offer is that the section on Historical Geography, which occupies twenty-seven pages out of the seventy-six devoted to Human Geography, seems disproportionately long, and it might have been well to save space here, and give a fuller treatment of towns. The matter relating to towns is indeed somewhat scattered through the book. Thus we find the reasons why Dublin is the capital discussed under the heading of Regional Geography, and not under Human Geography, where it might reasonably be expected. The information in regard to Belfast has to be sought in more than one section of the book, and we have not found any reference to the source of the coal used in its industries—a problem which forms a very favourite examination question. Trade altogether receives somewhat cursory treatment at Mr. Howarth's hands, and in the brief account of the steamer connections between Ireland and the larger island only passenger traffic is referred to.

The Place-Names of Berkshire. By the Rev. Walter R. Skeat. Oxford: At the Clarendon Press, 1911. *Price* 2*s. net.*

This small volume adds another to the list of counties whose place-names have been investigated by Mr. Skeat. He finds that the place-names of Berkshire are nearly all of native English origin, and are formed in strict accordance with the rules of Anglo-Saxon grammar. Nearly all, also, signify either possession, *e.g.* Sparsholt, or position, *e.g.* Eastbury. The county itself obtained its name from the fact that it once abounded in wood (from *Bearruc*, a diminutive of *bearu*, a wood, or grove). Among the trees the box was abundant, and has given their names to various places, *e.g.* Boxford and Boxgrove.

In the book the place-names are arranged under the various suffixes which they exhibit, and the diligent student will find many points of interest emerging from Mr. Skeat's investigations.

Nooks and Corners of Yorkshire. By J. S. Fletcher. With a Map. London: Eveleigh Nash, 1911. *Price* 2*s.* 6*d. net.*

This is a handy little volume which might well find a place in the knapsack of a walker or cyclist, visiting the less frequented parts of Yorkshire. There is a list of inns at the beginning, but no details or recommendations are given, and the letterpress would not suffice for the tourist in search of practical information, but those to whom the country is familiar, or who have furnished themselves with a

guide-book of more prosaic type in addition, will enjoy Mr. Fletcher's discursive accounts of places of interest, and his anecdotes of famous personages.

ASIA.

The Story of Korea. By Joseph H. Longford, late His Majesty's Consul at Nagasaki; Professor of Japanese, King's College, London; Barrister-at-law, Middle Temple; Author of "The Story of Old Japan." With Thirty-three Illustrations and Three Maps. London and Leipsic: T. Fisher Unwin, 1911. *Price* 10*s.* 6*d. net.*

Professor Longford's previous work on Japan was very warmly received, and we are confident that his book on Korea will meet with equal, if not greater, favour. A straightforward, concise history of Korea has long been desired. The author correctly states in his modest preface that in this country Korea is little more than a geographical expression: a reading of his book will leave no excuse for ignorance. In fewer than 400 pages we have the story of Korea from the earliest times to the present day. There is not one page which can be skipped, nor one which a reader desires to skip. All the facts are there, but each comes so naturally into its place that the general effect is that of an easily-flowing narrative. Yet there is no "padding."

Most people will be surprised to learn that Japan owes to Korea, not only its religions, but its culture and, in great measure, its art. So far Japan has ill repaid its debt, but it has now an opportunity of redeeming past errors by conferring upon that unhappy country such security as good government can bring. Professor Longford comments upon the lack of interest shown in this country in the Japanese annexation of Korea. "No word of sympathy with the ancient royal house of Korea was uttered in the English press, or by English statesmen." Not a single question was asked in Parliament. Possibly this was due to ignorance. So long as the great English public schools ignore all history and geography except those of ancient Greece and Rome, and possibly Palestine, it cannot be expected that English statesmen should know anything about outlandish places such as Korea, whose inhabitants were civilised when our ancestors were painted savages. But more possibly the apparent lack of interest was due to British common sense. It would be rather foolish to express sentimental sympathy which could do no possible good, and which, considering our relations with Japan, might do a great deal of harm. Does Professor Longford not remember the national indignation with a certain telegram to a South African President? Where all parts of the book are admirable it is difficult to single out any portion for special praise, but we have read again and again the sad but stirring story of the rise and fall of Christianity, and the Belisarius-like career of Admiral Yi Sun, the Korean Nelson. Besides thirty-three illustrations from photographs, there are two sketch-maps, a detailed map of Korea, and a bibliography. We cordially recommend this book, not only to students, but to all those who like entertaining reading. The latter class will gain instruction without knowing it.

AFRICA.

The Opening-up of Africa. By Sir H. H. Johnston, G.C.M.G., K.C.B. Home University Library of Modern Knowledge. London: Williams and Norgate. *Price* 1*s. net.*

The editors and publishers have been fortunate in being able to induce Sir Harry Johnston to write the book upon Africa in their Home University Series,

for he is recognised as the chief authority on all matters pertaining to negro Africa.

In this interesting little book he begins by a consideration of the negro in prehistoric times. He believes that the negro race originated from a stock common to it and the Australian somewhere in Southern Asia, whence the primitive negroes penetrated through Malayasia to New Guinea, and through Australia to Tasmania, and westwards through Persia, Mesopotamia, Syria and Arabia to Africa. At this time the great series of steppes and deserts which separates tropical Africa from the lands to the north had not developed, and access to the continent was easier. When the negro entered Africa he was scarcely above the Palaeolithic level of culture, and it is Sir Harry Johnston's main thesis that of himself he has never been able to rise above this level. Once entered into Africa he was gradually cut off by progressive desiccation from those lands to the eastern end of the Mediterranean where progress was taking place rapidly. But the separation was not absolute. From the time of the prosperity of Egypt onwards higher culture filtered across the deserts to the negroes to the south, though it was only assimilated to a small degree. The plough, for instance, never reached negroland till the nineteenth century. In successive chapters, the effects of the different invasions of Africa is described down to the present day, while a brief chapter on commercial development closes the whole. There is no index, which is much to be regretted in a book containing a considerable amount of detail.

"*Yakusu*": *The Very Heart of Africa. Being some Account of the Protestant Mission at Stanley Falls, Upper Congo.* By H. Sutton Smith, Baptist Missionary Society. London and Edinburgh: Marshall Brothers, Limited, 1911. *Price* 6*s.*

It is impossible to criticise this book from a geographical point of view, for, apart from a few slight general remarks about tribal customs and language, it contains nothing of geographical interest. The writer is obviously very much in earnest—an insincere missionary must be the most worthless creature in the universe—and he and his colleagues have done excellent work on the right lines. Nevertheless it is our strong opinion that the matter of this book should have been condensed to one-tenth of its present amount, and published as an article in some missionary magazine, for which, alike in style and treatment, it is eminently suitable.

GENERAL.

British Plants: Their Biology and Geology. By J. F. Bevis, B.A., B.Sc., and H. J. Jeffrey, A.R.C.Sc. London: Alston Rivers, 1911. *Price* 4*s.* 6*d. net.*

This is a very useful book which treats its subject from a modern standpoint, and thus links botany much more closely to geography than was formerly the case. It is divided into three parts:—(1) The environment and its influence upon vegetation; (2) The life of the individual plant—plant biology; (3) The British flora: its evolution and present distribution, and is illustrated by many clear and simple diagrams. The book is intended to be used as a companion to the elementary text-book and the field flora, and would be exceedingly useful in connection with Nature Study courses. The only suggestion that we have to offer is that the bibliography appended to the chapter on Plant Associations might be given a more prominent position, and might be enlarged to some extent, and some indication added as to the size and cost of the books named. We recommend the book to the notice of all teachers of Nature Knowledge, and the geographer also will find much to interest him in it.

BOOKS RECEIVED.

Java, Sumatra, and the Other Islands of the Dutch East Indies. By A. Cabaton. Translated and with a Preface by Bernard Miall. With a Map and 47 Illustrations. Demy 8vo. Pp. xvi + 376. *Price* 10*s.* 6*d. net.* London: T. Fisher Unwin, 1911.

Specimens of Bushman Folklore. Collected by the late W. H. L. Bleek, Ph.D., and L. C. Lloyd. Edited by the latter. With an Introduction by George M'Call Theal, D.Litt., LL.D., etc. Translated into English. Illustrations and Appendix. Demy 8vo. Pp. xl + 468. *Price* 21*s. net.* London: George Allan and Co., Ltd., 1911.

Climate Control. By L. C. W. Bonacina. Illustrated with Sketch-Maps, Diagrams, and Weather Charts. Cr. 8vo. Pp. viii + 167. *Price* 2*s.* London: Adam and Charles Black, 1911.

Influences of Geographic Environment on the Basis of Ratzel's System of Anthropo-Geography. By Ellen Churchill Semple. Demy 8vo. Pp. xviii + 683. *Price* 18*s. net.* London: Constable and Co., Ltd., 1911.

The Agricultural and Forest Products of British West Africa (Imperial Institute Handbooks). By Gerald C. Dudgeon. With Maps and Illustrations. Demy 8vo. Pp. x + 170. *Price* 6*s. net.* London: John Murray, 1911.

The River Findhorn from Source to Sea. By George Bain. With Illustrations. Cr. 4to. Pp. vii + 254. Nairn: *Nairnshire Telegraph* Office, 1911.

Across South America: An Account of a Journey from Buenos Aires to Lima by way of Potosi, with Notes on Brazil, Argentina, Bolivia, Chili, and Peru. By Hiram Bingham. With 80 Illustrations and Maps. Demy 8vo. Pp. xvi + 405. *Price* 12*s.* 6*d. net.* London: Constable and Co., Ltd., 1911.

Grundzüge der Physischen Erdkunde. Von Dr. Alexander Supan. Professor der Geographie an der Universität Breslau. Fünfte, umgearbeitete und verbesserte Auflage. Mit 270 Abbildungen im Text und zwanzig in Farbendruck. Demy 8vo. Pp. x + 970. *Preis* £1, 6*s.* 0*d.* Leipzig: Veit and Comp, 1911.

A Tenderfoot with Peary. By George Borup. With a Preface by G. W. Melville. With 46 Illustrations from Photographs and a Map. Cr. 8vo. Pp. xvi + 317. *Price* 6*s. net.* London: Eveleigh Nash, 1911.

South Africa To-day, with an Account of Modern Rhodesia. By H. Hamilton Fyfe. Demy 8vo. Pp. 299. *Price* 10*s.* 6*d. net.* London: Eveleigh Nash, 1911.

My Climbing Adventures in Four Continents. By Samuel Turner, F.R.G.S. With 74 Illustrations. Demy 8vo. Pp. 283. *Price* 12*s.* 6*d. net.* London: T. Fisher Unwin, 1911.

My Attainment of the Pole: Being the Record of the Expedition that First reached the Boreal Center, 1907-1909, *with the Final Summary of the Polar Controversy.* By Dr. Frederick A. Cook. Cr. 4to. Pp. xx + 604. New York: The Polar Publishing Co., 1911.

The Story of Coventry (Mediæval Town Series). By Mary Dormer Harris. Illustrated by Albert Chanler. Fcap 8vo. Pp. xii + 356. *Price* 4*s.* 6*d. net.* London: J. M. Dent and Sons, Ltd., 1911.

Questions and Exercises in Geography. 1. *The World: General Mathematical, Physical, and Economic Geography.* By Robert J. Finch. Cr. 8vo. Pp. xv + 48. *Price* 6*d. net.* London: Ralph Holland and Co., 1911.

Turkestan, "The Heart of Asia." By William Eleroy Curtis. Pictures by John T. M'Cutcheon. Demy 8vo. Pp. 344. *Price* 12*s. net.* London: Hodder and Stoughton, 1911.

Life in the Moslem East. By PIERRE PONAFIDINE. Translated from the Russian by EMMA COCHRAN PONAFIDINE. Numerous Illustrations. Demy 8vo. Pp. xiii + 429. *Price* 12*s. net.* London: Hodder and Stoughton, 1911.

New Zealand. By the Hon. Sir ROBERT STOUT, K.C.M.G., LL.D., and J. LOGAN STOUT, LL.B. (N.Z.). (Cambridge Manuals of Science and Literature). Cr. 8vo. Pp. vi + 185. *Price* 1*s. net.* Cambridge: University Press, 1911.

Cathedral Cities of Italy. Written and Illustrated by W. W. COLLINS, R.I. Demy 8vo. Pp. xii + 309. *Price* 16*s. net.* London: William Heinemann, 1911.

The Wanderings of Peoples. By A. C. HADDON, Sc.D., F.R.S. With 5 Maps. (Cambridge Manuals of Science and Literature.) Cr. 8vo. Pp. viii + 124. *Price* 1*s. net.* Cambridge: University Press, 1911.

India under Curzon and After. By LOVAT FRASER. Medium 8vo. Pp. xii + 496. *Price* 16*s. net.* London: William Heinemann, 1911.

Old Indian Trails: Incidents of Camp and Trail Life, covering Two Years' Explorations through the Rocky Mountains of Canada. By MARY T. S. SCHÄFFER. With 100 Illustrations from Photographs by the Author, and also by MARY W. ADAMS, and a Map. Small demy 8vo. Pp. xiv + 364. *Price* 7*s.* 6*d. net.* London: G. P. Putnam's Sons, 1911.

My Italian Year. By RICHARD BAGOT. Illustrated. Demy 8vo. Pp. vii + 341. *Price* 10*s.* 6*d. net.* London: Mills and Boon, Ltd., 1911.

A Class-Book of Practical Geography. By ERNEST YOUNG, B.Sc., and J. FAIRGRIEVE, M.A. Cr. 8vo. Pp. viii + 162. *Price* 1*s.* 6*d.* London: George Philip and Son, Ltd., 1911.

The Lands of the West. By ALEXANDER CROSS. Illustrations from Line Drawings by Mr. A. P. THOMSON, and Photographs by Mrs. CROSS and others. Cr. 8vo. Pp. vi + 272. *Price* 1*s. net.* Glasgow: James Hedderwick and Son, Ltd., 1911.

The Magic of Spain. By AUBREY F. G. BELL. Cr. 8vo. Pp. 264. *Price* 5*s. net.* London: John Lane, 1911.

Stalks in the Himalaya: Jottings of a Sportsman-Naturalist. By E. P. STEBBING, F.R.G.S., F.Z.S. With upwards of 100 Illustrations by the Author and others. Demy 8vo. Pp. xxviii + 321. *Price* 12*s.* 6*d. net.* London: John Lane, 1911.

Casuals in the Caucasus: The Diary of a Sporting Holiday. By AGNES HERBERT. With 22 Illustrations. Demy 8vo. Pp. xi + 331. *Price* 12*s.* 6*d. net.* London: John Lane, 1911.

Atlas de Finlande, 1910. Texte I. Nature (Cartes No. 1-23). Texte II. Population et Civilisation (Cartes No. 24-55). Medium 8vo. Helsingsfors: Société de Géographie de Finlande, 1911.

Little Cities of Italy. By ANDRÉ MAUREL. Translated by HELEN GERARD. With a Preface by GUGLIELMO FERRERO. With 30 Illustrations. Cr. 8vo. Pp. xvii + 295. London: G. P. Putnam's Sons, 1911.

Turkey and the Turks. By Z. DUCKETT FERRIMAN. Illustrated. Demy 8vo. Pp. ix + 334. *Price* 10*s.* 6*d. net.* London: Mills and Boon, Ltd., 1911.

Pilgrims to the Isles of Penance: Orchid-gathering in the East. By Mrs. TALBOT CLIFTON. With 54 Illustrations and a Map. Demy 8vo. Pp. 309. *Price* 12*s.* 6*s. net.* London: John Long, 1911.

South America To-day. By GEORGE CLEMENCEAU. Demy 8vo. Pp. 315. *Price* 12*s.* 6*d. net.* London: T. Fisher Unwin, 1911.

Austria-Hungary, with Excursions to Cetinje, Belgrade, and Bucharest: Handbook for Travellers. By KARL BAEDEKER. Cr. 8vo. Pp. xxii + 602. *Price* 10*s. net.* Leipzig: Karl Baedeker, Publisher, 1911.

Undiscovered Russia. By Stephen Graham. With 26 Illustrations and 3 Maps. Demy 8vo. Pp. xvi + 537. *Price* 12*s.* 6*d. net.* London: John Lane, 1911.

Flora of Jamaica: Containing Descriptions of the Flowering Plants known from the Island. By William Fawcett, B.Sc., F.L.S., and Alfred Marton Rendle, M.A., D.Sc., F.R.S., F.L.S. With Illustrations. Vol. I., Orchids. With 32 Plates. Demy 8vo. Pp. xx + 150. *Price* 10*s.* 6*d.* London: British Museum (Natural History), 1911.

Catalogue of the Fresh-Water Fishes of Africa in the British Museum (Natural History). Vol. II. By George Albert Boulenger, F.R.S. Royal 8vo. Pp. xii. + 529. *Price* £2, 5*s.* London: British Museum (Natural History), 1911.

A Handbook of the Tsetse-Flies. By Ernest Edward Austen. With 10 Coloured Plates and Illustrations in the Text by A. J. Engel Tezi. Demy 8vo. Pp. x + 110. *Price* 5*s.* 6*d.* London: British Museum (Natural History), 1911.

In the Heart of the Vosges and other Sketches by a "Devious Traveller." By Mrs. Betham-Edwards. With Illustrations by Special Permission. Demy 8vo. Pp. viii + 327. *Price* 10*s.* 6*d. net.* London: Chapman and Hall, Ltd., 1911.

Under Western Skies: Life-Pictures from Memory. By Francis Sinclair. Cr. 8vo. Pp. vii + 432. *Price* 6*s.* London: Sampson Low, Marston and Co., Ltd., 1911.

Durch Armenien, eine Wanderung und der Zug Xenophon's bis zum Schwarzen-Meere. Eine Militär-Geographische Studie von E. v. Hoffmeister. Mit 5 Vollbildern, 96 Abbildungen, meist nach Originalaufnahmen des Verfassers, 2 Kartenskizzen im Text sowie 2 Kartenbeilagen. Royal 8vo. Pp. ix + 251. *Price M.* 8. Leipzig: B. G. Teubner, 1911.

My Experience at Nan Shan and Port Arthur with the Fifth East Siberian Rifles. By Lieut.-General N. A. Tretyakov. Translated by Lieutenant A. C. Alford, R.A. Edited by Captain F. Nolan Baker, R.A. With Maps and Illustrations. Demy 8vo. Pp. xvi + 312. *Price* 12*s.* 6*d. net.* London: Hugh Rees, Ltd., 1911.

Under the Roof of the Jungle: A Book of Animal Life in the Guiana Wilds. By Charles Livingston Bull. With 60 full-page Plates and many minor Decorations and Drawings from Life by the Author. Demy 8vo. Pp. xiv + 271. *Price* 6*s. net.* London: Duckworth and Co., 1911.

Things seen in Venice. By Lonsdale Ragg, B.D.(Oxon.), and Laura M. Ragg. With 50 Illustrations. 16mo. Pp. 253. *Price* 2*s. net.* London: Seely, Service and Co., Ltd., 1911.

Eighteen Capitals of China. By William Edgar Geil, M.A., Litt.D., F.R.G.S., etc. With 139 Illustrations. Demy 8vo. Pp. xx + 429. *Price* 21*s. net.* London: Constable and Co., Ltd., 1911.

Asia and Europe: Studies presenting the Conclusions formed by the Author in a long Life devoted to the Subject of the Relations between Asia and Europe. By Meredith Townsend. Fourth Edition. Demy 8vo. Pp. xxiv + 404. *Price* 5*s. net.* London: Constable and Co., Ltd., 1911.

Handbook of the Southern Nigeria Survey and Text-Book of Topographical Surveying in Tropical Africa. By Major F. G. Guggisberg, C.M.G., R.E., Director of Surveys, Southern Nigeria. Demy 8vo. Pp. xii + 246. *Price* 3*s.* 6*d.* Edinburgh: W. and A. K. Johnston, Ltd., 1911.

Deutsche Grammatik für Japaner, mit Übungsstücken und Wörterverzeichnissen. Von A. Seidel. Demy 8vo. Pp. xii + 188. *Price M.* 7.50. Berlin: Markische Verlagsanstalt, 1911.

Secrets of the Hills and how Ronald read them. By Sterling Craig, M.A., LL.B. Cr. 8vo. Pp. 320. *Price* 3*s.* 6*d. net.* London: George G. Harrap and Co., 1911.

Man and Beast in Eastern Ethiopia, from Observations made in British East Africa, Uganda, and the Sudan. By J. Bland-Sutton, F.R.C.S.Eng. With 204 Engravings on Wood. Demy 8vo. Pp. xii + 419. *Price* 12*s. net.* London: Macmillan and Co., Ltd., 1911.

Sport on the Nilgiris and Wynaad. By F. W. F. Fletcher. Demy 8vo. Pp. xvii + 455. *Price* 12*s. net.* London: Macmillan and Co., Ltd., 1911.

The Southern Slav Question and the Habsburg Monarchy. By R. W. Seton-Watson, D.Litt.(Oxon). Demy 8vo. Pp. xii + 463. *Price* 12*s.* 6*d. net.* London: Constable and Co., Ltd., 1911.

Sugar (Peeps at Industries). By Edith A. Browne. Containing 24 pages of Illustrations from Photographs. Large Cr. 8vo. Pp. vii + 88. *Price* 1*s.* 6*d. net.* London: Adam and Charles Black, 1911.

Britain Across the Seas. America: A History and Description of the British Empire in America. By Arthur Granville Bradley. Demy 8vo. Pp. xiv + 454. *Price* 12*s.* 6*d. net.* London: National Society's Depository, 1911.

North Uist: Its Archæology and Topography, with Notes upon the Early History of the Outer Hebrides. By Erskine Beveridge, LL.D. With 150 full-page Illustrations and 2 Maps. Cr. 4to. Pp. xxvi + 348. *Price* 30*s. net.* Edinburgh: William Brown, 1911.

Types of British Vegetation. By Members of the Central Committee for the Survey and Study of British Vegetation. Edited by A. G. Tansley, M.A., F.L.S., University Lecturer on Botany in the University of Cambridge. With 36 Plates and 21 Figures in the Text. Demy 8vo. Pp. xx + 416. *Price* 6*s. net.* Cambridge: University Press, 1911.

The Realm of Nature: An Outline of Physiography. By Hugh Robert Mill, D.Sc., F.R.S.E. With 19 Coloured Maps and 68 Illustrations. Demy 8vo. Pp. xii + 269. *Price* 5*s. net.* London: John Murray, 1908.

Statistical Abstract for the United Kingdom in each of the last Fifteen Years, 1896 *to* 1910. Fifty-eighth Number. *Price* 1*s.* 9*d.* London, 1911.

The Edinburgh University Calendar, 1911-12. *Price* 3*s. net.* Edinburgh, 1911.

The Geology of Colonsay and Oronsay, with Part of the Ross of Mull. (Explanation of Sheet 35, with part of 27.) By E. H. Cunningham Craig, B.A.; W. B. Wright, B.A., and E. B. Bailey, B.A. With Notes by C. T. Clough, M.A., and J. S. Flett, M.B., C.M., D.Sc. *Price* 2*s.* 3*d.* London: Board of Agriculture and Fisheries, 1911.

Catalogue of Admiralty Charts, Plans, and Sailing Directions, 1911. Corrected to 31st December 1910. London: His Majesty's Stationery Office, 1911.

Statistics of the Dominion of Canada. With Map. Ottawa: Department of the Interior, 1911.

Geographisches Jahrbuch, 34 Band, 1911. Herausgegeben von Hermann Wagner. Erste Hälfte. *Preis M.* 15. Gotha: Justus Perthes, 1911.

The Geology of the Glasgow District. (Glasgow District Map, including parts of Sheets 30, 31, 22, and 23.) By C. T. Clough, M.A., F.G.S.; L. W. Hinxman, B.A., F.R.S.E.; the late J. S. Grant Wilson; C. B. Crampton, M.B., C.M.; W. B. Wright, B.A., F.G.S.; E. B. Bailey, B.A., F.G.S.; E. M. Anderson, M.A., B.Sc.; R. S. Carruthers, F.G.S. With Contributions from G. W. Grabham, M.A.; J. S. Flett, M.A., D.Sc., F.R.S.E., and a Chapter on the Palæontology by G. W. Lee, D.Sc., F.R.S.E. *Price* 4*s.* 6*d.* London: Board of Agriculture and Fisheries, 1911.

General Report of the Operations of the Survey of India during the Survey Year, 1909-10. *Price* 3*s.* Calcutta, 1911.

Report on the Dune-Areas of New Zealand: Their Geology, Botany, and

Reclamation. By L. Cockayne, Ph.D., F.L.S. New Zealand: Department of Lands, 1911.

Handbook of the British Solomon Islands Protectorate. With Returns up to 31st March 1911. With Map. Tulagi, 1911.

District Gazetteers of the United Provinces. Vols. x., xi., xxxvi. Allahabad, 1910.

Bengal District Gazetteers: Purnea and Midnapore. Calcutta, 1911.

Eastern Bengal District Gazetteers, iii., iv., xi. Allahabad, 1911.

Central Provinces District Gazetteers: Buldana and Drug Districts. Calcutta, 1911.

Burma Gazetteers: Thayetmyo District. Vol. a. Rangoon, 1911.

Diplomatic and Consular Reports.—Trade and Commerce of the Consular District of Gothenburg, 1910 (4770); Trade of the Consular District of Bilbao, 1910 (4771); Trade of the Province of Angola, 1910 (4772); Trade and Navigation of the Consular District of Kobe, 1910 (4774); Trade, etc., of the Province of Lecce, 1910 (4775); Trade, Shipping, and Agriculture of Crete, 1910 (4776); Foreign Trade of Austria-Hungary, 1910 (4777); Finances of Italy, 1910 (4778); Trade of Elba, 1910 (4779); Trade and Resources of the Congo (4780); Trade and Agriculture of the Consular District of Odessa, 1910 (4781); Trade of the Consular District of Malaga, 1910 (4783); Trade of Ancona, 1910 (4784); Trade and Commerce of the Consular District of Hamburg, 1910 (4782); Trade and Commerce of the Consular District of Buenos Ayres, 1910 (4785); Trade and Commerce of the Consular District of Stockholm, 1910 (4786); Trade and Commerce of Fiume, 1910 (4787); Trade and Shipping of Cartagena, 1910 (4788); Trade and Commerce of Leghorn, 1910 (4791); Trade of the Consular District of Leipzig, 1910 (4793); Trade and Commerce of the Consular District of Batoum, 1910 (4683); Trade and Commerce of Port Said and Suez, 1910 (4767); Trade and Commerce of the Consular District of Rosario, 1910 (4790); Trade of the Provinces of Seistan and Kain, 1910-11 (4792); Trade of Khorasan, 1910-11 (4794); Trade of the Regency of Tunis, 1910 (4795); Trade of Persia, 1909-10 (4796); Trade of the Consular District of Salonica, 1910 (4797); Trade and Agriculture of Bavaria, 1910-11 (4798).

Colonial Reports (Annual).—The Surveys of British Africa, Ceylon, Cyprus, Fiji, Jamaica, Trinidad, British Honduras, 1910-11 (685); Report for Malta, 1910-11 (686); Report for Gold Coast, 1910 (688); Report on the work of the Imperial Institute, 1910 (687); Report for Fiji, 1910 (689); Report for Somaliland, 1910-11 (690).

Colonial Reports (Miscellaneous).—Report on the Census of Weihaiwei, 1911 (78).

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One-inch Map (new series), colour printed, solid and drift editions. *Isle of Colonsay.*—Sheet 35. Price 2s. 6d. The solid is shown in colour. The drift by symbols in black.

Memoirs of the Geological Survey.—The Geology of Colonsay and Oronsay, with part of the Ross of Mull. (Explanation of Sheet 35 with part of 27.) By E. H. Cunningham Craig, B.A.; W. B. Wright, B.A., and E. B. Bailey, B.A. With Notes by C. T. Clough, M.A., and J. S. Flett, M.B., C.M., D.Sc. Price 2s. 3d.

The following publications were issued from 1st to 7th October 1911 :—

One-inch Map (new series), colour printed, solid and drift editions. Glasgow District (parts of Sheets 30, 31, 22, 23). Price 2s. The solid is shown in colour. The drift by symbols in black.

Memoirs of the Geological Survey (the Geology of the Glasgow District).—Glasgow District Map, including parts of Sheets 30, 31, 22, 23. By C. T. Clough, M.A., F.G.S.; L. W. Hinxman, B.A., F.R.S.E.; the late J. S. Grant Wilson; C. B. Crampton, M.B., C.M.; W. B. Wright, B.A., F.G.S.; E. B. Bailey, B.A., F.G.S.; E. M. Anderson, M.A., B.Sc.; R. G. Carruthers, F.G.S. With Contributions from G. W. Graham, M.A.; J. S. Flett, M.A., D.Sc., F.R.S.E., and a Chapter on the Palæontology by G. W. Lee, D.Sc., F.R.S.E. Price 4s. 6d.

GEOLOGICAL SURVEY OF SCOTLAND.—Scale 1 : 63,360 or 1 inch to a mile. Sheet 35, Colonsay. 1911. Printed in colours. Price 2s. 6d.

Presented by the Board of Agriculture and Fisheries.

CONTOUR OUTLINE MAP OF SCOTLAND.—Philip's Visual Series in enlarged form for teachers' use. Size 42 by 32 inches. Price 1s. net.

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This is one of a series of bold outline maps printed in black. They are designed for colouring by the teacher to show any special features that may be desired.

ENGLAND.—Bathy-orographical Map, constructed and engraved by W. and A. K. Johnston, Limited. Scale 1 : 600,000 or 9 miles to an inch. Mounted on rollers, varnished. Price 12s.

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This is the latest addition to Messrs. Johnston's effective series of physical school wall-maps.

ENGLAND AND WALES.—Bartholomew's "Half-inch to Mile Map." Sheet 34, Dorset; Sheet 36, South Devon. 1911. Price each sheet, 1s. 6d. paper; 2s. cloth. *John Bartholomew and Co., Edinburgh.*

These are new editions, revised to date, with uniform contour colouring.

ASIA.

INDIA.—Railway and Canal Map, 1910. Scale 1 : 2,027,520 or 32 miles to an inch. Different railway systems separately coloured. Six sheets.
Survey of Indian Office, Calcutta.

INDIA AND ADJACENT COUNTRIES.—Scale 1 : 1,000,000 or about 16 miles to an inch. 1910-1911. Price 1 Rupee each sheet.
Sheet 38, N. W. Frontier Province, etc. ; 44, Punjab and Rajputana ; 47, Bombay and Hyderabad ; 100, Part of Tibet and China ; 101, Part of China. *Survey of India Office, Calcutta.*

INDIA—UNITED PROVINCES.—Scale 1 : 2,027,520 or 32 miles to an inch. 1910. Price 1 Rupee.

BURMA.—Sheet 84,0. Part of Myingyan District, etc. Scale 1 : 253,440 or 4 miles to an inch. 1910. Price 1 Rupee. *Survey of India Office, Calcutta.*

INDO-CHINE.—Feuille x. de la carte de l'Asie en dix feuilles. Echelle de 1 : 5,000,000. Atlas Universel de Géographie ; commencé par M. Vivien de Saint-Martin et continué par Fr. Schrader. Price 2 francs.
Librairie Hachette et Cie, Paris.

JAPANESE EMPIRE.—Topographical Map by the Imperial Geological Survey of Japan. Scale 1 : 1,000,000 or about 16 miles to an inch. With inset Hypsometrical and Bathymetrical Chart, and Political Map.
Presented by Naomasa Yamasaki, Professor of Geography in the University of Tokio.

A most valuable standard reference map.

LOWER MESOPOTAMIA between Baghdad and the Persian Gulf. Scale 1 : 1,000,000 or about 16 miles to an inch. 1911. Price 2s. 6d.
Geographical Section, General Staff, London.

AFRICA.

BASUTOLAND.—Scale 1 : 250,000 or 4 miles to an inch. 1911. Four sheets. Price 2s. 6d. each sheet. *Geographical Section, General Staff, London.*

This map has been prepared from a reconnaissance survey by Captain M. C. Dobson in 1904-9. It shows contour lines at every 100 feet.

KAMERUN.—Karte in 20 Blätter und 4 Ansatzstücken im Massstabe von 1 : 300,000, bearbeitet von Max Moisel. Im Auftrage und mit Unterstützung des Reichs-Kolonialamts. 1911. Blatt H 1, 2, Kribi. Price M. 2.
Dietrich Reimer (Ernst Vohsen), Berlin.

UGANDA.—Scale 1 : 250,000, or 4 miles to an inch. 1911. Sheets, Masindi Port, Lake Albert, Masaka, Ripon Falls, Mubendi, Bululu. Price 2s. each sheet.
Geographical Section, General Staff, London.

This beautiful map is specially interesting as showing the land surface features, forests, cultivated lands, etc., as well as the motoring roads in this distant province of the Empire.

NIGERIA.—Bauchi Mines Survey, Naraguta Sheet. Scale 1 : 25,000 or about 2½ inches to a mile. 1911. *Geographical Section, General Staff, London.*

GENERAL.

WILSON'S FOLDING GLOBE.—Circumference 40 inches. Price 7s. 6d. net.

WILSON'S MERCATOR.—Size 44 by 36 inches. Price, mounted, 6s.

WILSON'S EQUAL SCALE MAP OF THE WORLD.—Size 42 by 28 inches. Price, mounted, 6s. *George Philip and Son, Limited, London.*

The "Folding Globe" is a simple and ingenious arrangement for holding together the gores of a globe without the expensive process of mounting on a

sphere. In this respect it has the advantage of cheapness, but it also has the farther advantage of showing, when flattened out, the relation between the globe and the flat projection of a map. Contrasted with Mercator's Projection, it affords a practical demonstration illustrating the construction of Mercator. The globe is very clearly engraved and coloured politically. It is easily handled, and, with a circumference of forty inches, is on a large enough scale for teaching use.

SCHOLAR'S GEOGRAPHICAL EXERCISE BOOK.—The World. Cr. 4to. Price 4d. net. *W. and A. K. Johnston, Limited, Edinburgh and London.*

This book provides blank outline maps of the principal countries in the world, in duplicate. These ought to prove most useful for summarising the main facts of a lesson. There are also sheets of squared paper for the drawing of curves and diagrams.

NEW ATLASES.

ATLAS DE FINLANDE. 1910.—Rédigé par le Comité de Rédaction.—Colonel Max Alfthan, Président, Ing. Onni Ollila, Prof. J. J. Sederholm, Prof. J. A. Palmén, Prof. E. G. Palmén, Dr. K. R. v. Willebrand. Avec deux volumes de Texte. *Publié par la Société de Géographie de Finlande, Helsingfors.*

The Geographical Society of Finland is to be congratulated on the publication of a work which any scientific society may well be proud of. It is no exaggeration to say that the Atlas of Finland, with its accompanying volumes of descriptive text, is an altogether unique piece of work. The compilation and mapping have been set about in a most systematic manner, and the whole organisation sets an example which geographical societies in other countries might do well to follow. In our limited space it is unfortunately impossible to give an adequate idea of all the information displayed in these volumes. Every department of geographical research is represented. The first section deals with the physical character of the country, and includes Orography, Geology, Oceanography, Meteorology, Forestry, Botany, and Zoology. The second section treats of the human aspects, and includes Density of Population, Diseases, Mortality, Agriculture, Industries, Commerce, Shipping, Communications, Ethnology, Politics, Education, History, and Archæology. All these subjects are treated cartographically in a most luminous manner, and what is not shown on the maps is set forth in the volumes of descriptive text. The atlas may be summarised as a complete compendium of the geography of Finland. The whole work is beautifully and artistically produced in a manner altogether worthy of the importance of the subject.

PHILIP'S NEW HISTORICAL ATLAS FOR STUDENTS.—By Ramsay Muir, M.A., Professor of Modern History in the University of Liverpool. 1911. Price, cloth, 9s. net. *George Philip and Son, Limited, London.*

This atlas consists of a series of sixty-five plates, containing one hundred and fifty-four coloured maps and diagrams, with introductory text illustrated by forty-three maps and plans in black and white. The atlas is eminently well planned for teaching purposes. The maps are clear and not crowded with names. Numerous orographical maps are valuable as showing the physical basis for historical teaching, whilst the various chronological maps illustrate the political evolution of the states of the world. The introductory text explains the maps, and an index completes the usefulness of this excellent work.

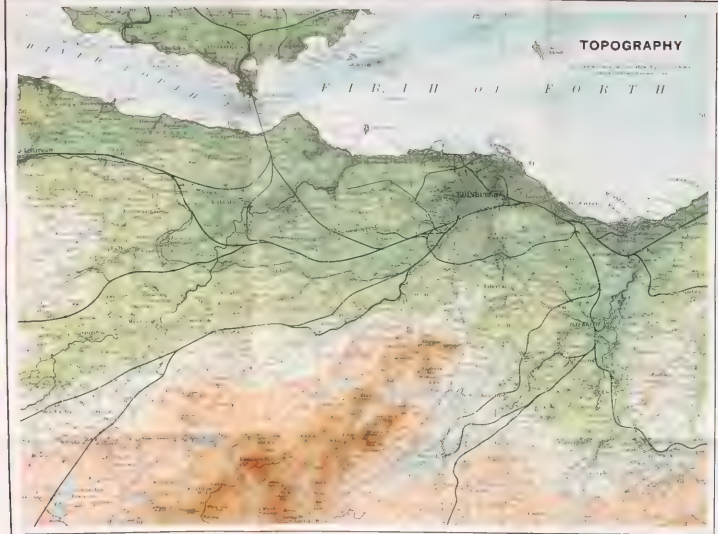
THE COMPARATIVE ATLAS.—Physical and Political. By J. G. Bartholomew, LL.D., etc. 72 Maps, with Index, Ninth Edition, Revised and Improved. 1911. Price 2s. 6d. *Meiklejohn and Son, London.*

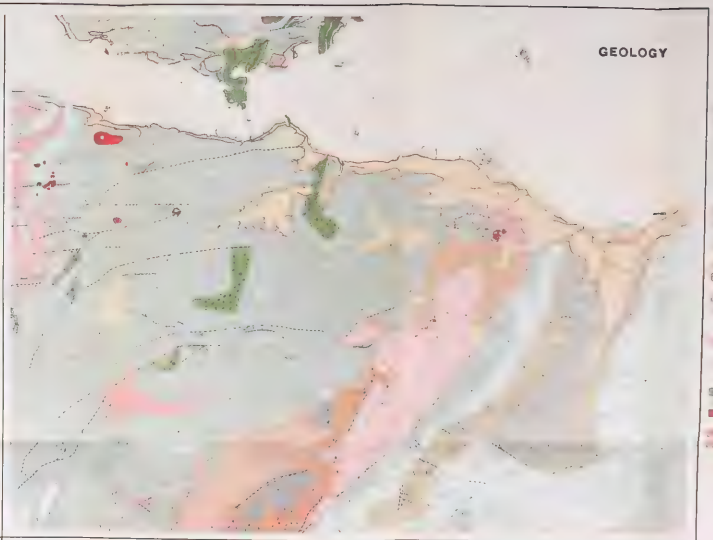
In this new edition some of the maps have been newly engraved, and physical colouring introduced to a greater extent.

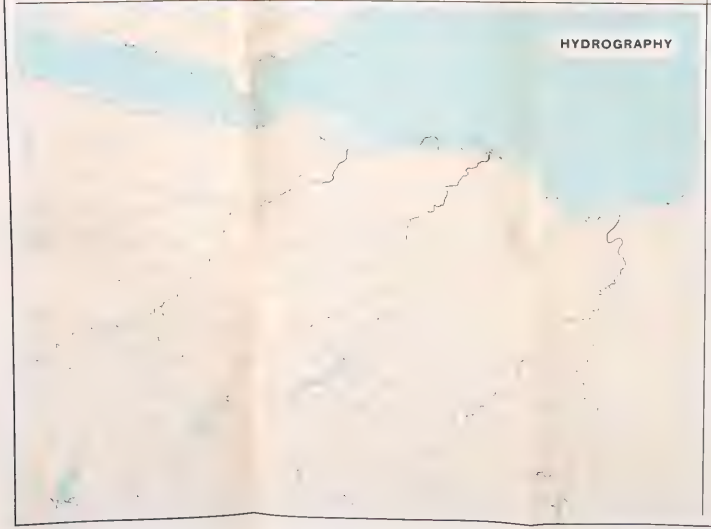
MAPS OF EDINBURGH DISTRICT

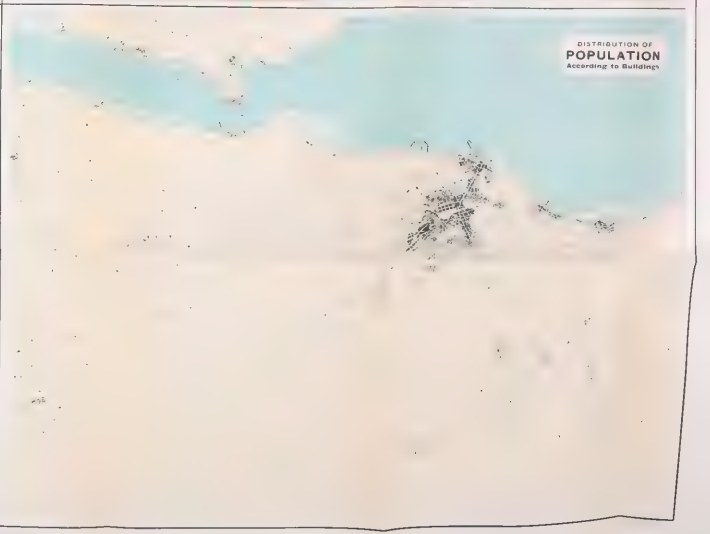
(SHEET 32 OF ORDNANCE SURVEY)

TO ACCOMPANY Mr J COSSARS PAPER









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THE SCOTTISH GEOGRAPHICAL MAGAZINE.

THE NORSEMEN IN AMERICA.[1]

By Dr. Fridtjof Nansen, G.C.V.O.

(With Sketch-Maps.)

During early times the world appeared to mankind like a fairy tale: everything that lay beyond the circle of familiar experience was a shifting cloudland of the fancy, a playground for all the fabled beings of mythology: but in the farthest distance, towards the west and north, sea, land, and sky were merged into a congealed mass—the realm of darkness—and beyond this gaped the immeasurable mouth of the abyss, the terror of empty space.

Thus it remained during the early Middle Ages. In those days, northern England was near the border of the known world. The great change was brought about by the Norsemen. With their remarkable power of expansion they extended their wanderings over western and southern Europe, and penetrated the vast unknown solitudes in the north. They found their way to the White Sea, and the lands beyond: they discovered the wide Arctic Ocean and its lands: they settled in the Scottish islands, found and colonised the Faroes, Iceland, Greenland: were the discoverers of the Atlantic Ocean and of North America.

Above all, they were the great pioneers in traversing the ocean. Before them, all navigation had been more or less coast navigation, the sailors sailing chiefly along the coasts from place to place, and never venturing very far from the known land. The general idea of the world made it an island, surrounded on all sides by the sea, beyond which was the darkness of the unknown. The Norsemen destroyed, by their discoveries, these learned ideas: in their small undecked vessels they

[1] An Address delivered to the Royal Scottish Geographical Society in Edinburgh, on November 9, 1911.

sailed across the outer ocean, and found lands beyond. Thus they taught humanity the art of oceanic navigation, which marks in reality perhaps the greatest discovery in the history of exploration.

The first information about the northern discoveries of the Norsemen is met with in England, in King Alfred's Anglo-Saxon edition of Orosius's history, in the close of the ninth century.

A later source is the description of the islands of the north, written by Adam of Bremen, about 1070. But by far the most important part of our knowledge of the discoveries of the Norsemen is derived from the Norse-Icelandic literature of the twelfth, thirteenth, and fourteenth centuries, chiefly put into writing in that strange island Iceland, rising with its black volcanoes and lava-fields, and its white snow-glaciers, above the dark waves of the north ocean, "like the waste chaotic battle-field of Frost and Fire."

A sombre undercurrent runs through these narratives of voyages across unknown seas: even though they may be partly legendary, they nevertheless bear witness to the silent enduring struggle of hardy men with ice, storms, cold, and want, in the light summer and the long dark winter of the north.

Fancy what it meant to cross the stormy and often misty northern seas in those days, or to cross the Atlantic in those vessels. They had no compass for finding their course, no instrument for finding their place, only the sun and the stars to steer by; but when there were none to be seen for days, perhaps for weeks! We know that many of them found their way, but do not know how many more were lost and never heard of. And still they went on.

I cannot think of them without remembering Carlyle's words about these "old true sea-kings!" What an indomitable rugged energy! In their small undecked vessels they forced their way across the dangerous waters into the unknown, "silent, with closed lips, unconscious that they were specially brave."

But we cannot go deeper into this absorbing subject now. To-night I propose to discuss what the old literature has to tell about the Norse discoveries in the farthest west, and especially what is told of that wonderful land called "Wineland the Good."

As is well known, the Norse Icelanders, led by the Norse chief Eric the Red, discovered Greenland, and founded two settlements on its south-western coast in the end of the tenth century. It seems probable that, not very long after this, weather-beaten seafarers from Greenland discovered lands still farther towards the west or rather towards the south-west. The Icelandic literature contains remarkable statements about such countries. They are called: "Helluland" (*i.e.* slate or stone-land), "Markland" (*i.e.* woodland), "Furðu-strandir" (*i.e.* marvel-strands), and "Wineland the Good." Yet another, which lay west of Ireland and not far from Wineland, was called "Hvitramannaland" (*i.e.* the white men's land), or "Great Ireland."

Although some of these countries are legendary, as we shall see, it must be regarded as certain that the Norsemen reached some of them, which lay on the northern east coast of America: and they thus dis-

covered the continent of North America, besides Greenland, about five hundred years before Cabot (and Columbus).

Quite a different question is it, however, whether those accounts of voyages to these countries which we find in the Icelandic sagas are historical. Whilst most historians now agree that Hvitramannaland, or Great Ireland, and the account of Are Marson's voyage thither are merely legendary, it has been universally accepted as an established fact that Wineland was some part of America, and that the accounts of the discovery of this country and voyages thither were historical. My researches have, however, led me to very different views.

The story of the discovery of Wineland is the following, according to what is considered to be the most trustworthy accounts.

Some time after Greenland had been discovered by Eric the Red, and the Norsemen had settled there about 985, Eric's son, Leif, sailed to Norway from Greenland, it has been said, in the year 999. This is the first time a voyage straight across the Atlantic is mentioned in literature. Leif came to King Olaf Tryggvason in Norway, and spent the winter there. He adopted Christianity and promised the king to try to introduce the faith in Greenland. In the spring he set out again to sail straight across the Atlantic to Greenland. But he was driven out of his course, and "for a long time drifted about in the sea, and came upon countries of which before he had no suspicion. There were self-sown wheatfields, and vines grew there." He also found large trees, which he took home with him to Greenland, where he introduced Christianity. He was afterwards called Leifr hinn Heppni (*i.e.* Leif the Lucky).

In the following year, Leif's brother Thorstein is said to have made an attempt to find the land Leif had discovered, but was unfortunate, and was drifted eastwards towards Iceland and Ireland.

The next year, an Icelandic merchant, Thorfinn Karlsevne, who had come to Greenland, equipped a new expedition which sailed out with three ships: it was evidently supposed towards the south. After two days, they came to a land, which they called Helluland (*i.e.* slate or stone-land), on account of the many flat stones. After two days more, they came to a land they called Markland (*i.e.* woodland), on account of the forests. When they had once more sailed for two days, they sighted land, and came to some extensive sandy strands which they called "Furðu-strandir' (*i.e.* marvel-strands).

They now sailed southwards along the coast, wintered in a fjord, went on next year, and then they came to the land with vines and self-sown wheat. They stayed the winter there, but were attacked by the natives, called Skrælings, and had to withdraw northward. After having spent the third winter in the same fjord where they had been the first winter, Karlsevne returned to Greenland with one ship, whilst the two other ships were drifted towards Ireland and lost.

This is very briefly the story of the discovery of Wineland, and the attempt at a settlement there, as told in the saga of Eric the Red, which is generally considered to be the most trustworthy source. But this saga was not written till the thirteenth century, perhaps in some year between 1270 and 1300; that is two hundred and fifty or three hundred

years after the time when the events are said to have occurred. It might seem desirable to find some earlier evidences, in order to strengthen one's faith in the trustworthiness of the account. But the unfortunate fact is that the earlier literature contains hardly any indication of these voyages. The name "Wineland," or "Wineland the Good," is mentioned, but nothing is told about its discovery, and in the chief source of Icelandic history, the Landnámabók, probably originally from the twelfth century, Leif Ericson's name is mentioned, but not a word of his discovery of Wineland; he has not even got his surname of "the Lucky," and there is no mention of his introduction of Christianity into Greenland.

It is not till well on in the thirteenth century that Leif's surname of "Heppni," the Lucky, his discovery of Wineland, and his Christianising of Greenland are mentioned in the Kristni-saga and the Heimskringla by Snorre Sturlason. But still there is nothing about vines. It is not till the close of the thirteenth century that any information occurs as to what and where Wineland was (with statements as to the vines and wheat there), and a description of voyages thither: this is in the Saga of Eric the Red, as I have already mentioned.

But then, after that time, we find in the Flateyjarbók, written about 1387, quite a different story about the voyages to Wineland. The land, it is told, was discovered by a man called Bjarne Herjolfsson, Leif Ericson not being mentioned in that connection; the one expedition led by Thorfinn Karlsevne has been divided into four different expeditions, one of them being led by Leif Ericson, etc. It seems to me to be weakening our faith in the whole story, that the two only known narratives of these voyages disagree to such an extent, and that even the first of them was put into writing so very late. The historians have tried to get out of the difficulty by declaring the account of the Flateyjarbók to be unhistorical, and more or less fictitious, whilst Eric the Red's saga may be perfectly trustworthy. This is an easy method, but one feels tempted to ask whether it is reasonable to suppose that traditions should have been handed down by word of mouth in such a remarkably unaltered and uncorrupted state as the historians pretend, during the first two hundred and fifty or three hundred years, when we see that they have been transformed and confused to such an extent scarcely a hundred years later? This can hardly be admitted to be psychologically probable.

If one's faith in the accounts of the Wineland voyages is seriously shaken by facts such as these, I think it will be still more so by studying the details of the account in the saga of Eric the Red, which has been declared to be the most trustworthy.

Let us first consider the description of the most important discovery, Wineland itself. The oldest known source in which Wineland is mentioned is Adam of Bremen's description of the island in the western and northern ocean. After having described the Orkneys, Iceland (Thule), Greenland, Halagland (the northern part of Norway, which he makes into an island), he says that King Svein of Denmark "mentioned yet another island, which had been discovered by many

in that ocean, and which is called Wineland, because vines grow there of themselves and give the best wine. And that there is abundance of unsown corn we have obtained certain knowledge, not by fabulous suppositions, but from trustworthy information of Danes. Beyond this island, he (*i.e.* the Danish king) said, no habitable land is found in this ocean, but all that is more distant is full of intolerable ice and immense darkness. . . ."

This description of Wineland offers remarkably close resemblance to the legendary ideas met with in earlier literature. The two distinguishing features of Wineland, the self-grown *vines* and the unsown *corn* (or wheat), are exactly the same as those we find in the description of the Fortunate Isles in Isidorus Hispalensis (seventh century), who characterises them as being the islands with "self-grown vines" and "cornfields" (*i.e.* wheatfields) growing wild like grass. These isles were in the western ocean, originally west of Africa (Mauritania or Morocco). They were the African islands.

Beyond Wineland was the dark sea filled with ice. This is evidently the dark and curdled sea which we find in the legends of antiquity, even before Pytheas, and during the early Middle Ages and in the legends of the Arabs. This dark congealed sea formed the boundary of the world, especially towards the north and west, and in its immediate neighbourhood were the Fortunate Isles. It is indeed a remarkable coincidence that these same features, the self-grown vines, the wild cornfields, and the situation near the dark sea, are the distinguishing features mentioned for Wineland as well as for the Fortunate Isles. Even as far back as the time of Homer's *Odyssey*, Sheria, the happy land of the Phœnicians, lying in the ocean far to the west, was shrouded in darkness.

Adam says that his island Wineland had been discovered by several, but does not give any names (which he, however, does in some other cases): this also leads our thought towards the Fortunate Isles, because there were many tales current about voyages thither.

In Icelandic literature, the name Wineland is first mentioned by Are Frode in about 1130. While mentioning the natives of Greenland, he says that they are the same people that inhabit Wineland, and are called Skrælings. But what and where Wineland is, he does not say; it may be a land which was really discovered, or it may be a fairyland, perhaps well known at that time from fairy tales and legends. As the name "Skræling," which was applied to the Eskimo of Greenland, was very probably before that time used as a name for gnomes or brownies or mythical beings, the possibility of Are's Wineland being a fairyland is much increased. In Arabic and also in Irish legends, similar mythical people are described as inhabiting some of the Fortunate Isles in the western ocean, and the descriptions have features resembling those of the Skrælings in Wineland. The probability that Are's Wineland is fairyland is strongly supported by the next mention of Wineland in Icelandic literature, in the Landnámabók, where it is only said that Hvítramannaland (the white men's land), also called Great Ireland, lay near Wineland the Good. As Hvítramannaland was a mythical land

from Irish legends, as can now be proved with certainty, the probability is that Wineland the Good, which was near it, was also mythical. But as the statement in the Landnámabók originates from Are Frode, there can hardly be much doubt that his Wineland inhabited by Skrælings was the same mythical land.

Before the saga of Eric the Red, Icelandic literature has practically nothing more to tell us about Wineland the Good, with the exception of the before-mentioned statement in some sagas from the thirteenth century that it was found by Lief Ericson.

In Eric the Red's saga, we get, however, at last a description of the land, according to which it lies somewhere to the south or south-west of Greenland, and we hear about Thorfinn Karlsevne and his men that "there they found self-sown wheatfields, where the land was low, but vines wherever they saw heights." Let us compare this with what Isidore says of the Fortunate Isles. His description is—

"The Fortunate Isles denote by their name that they produce all good things, as though fortunate and blessed with fertility of vegetation. For of their own nature they are rich in valuable fruits. The mountain-ridges are clothed with self-grown vines, and cornfields and vegetables are common as grass" (*i.e.* grow wild like grass, are self-grown).

It must, I think, be admitted that the likeness between the two descriptions is so close that it cannot be explained away as fortuitous: it would be a remarkable coincidence indeed if there is not some connection between them. Furthermore, we hear in the saga that when Leif Ericson discovered the land to the west, which, however, is given no name, he found there self-sown wheatfields and vines and big trees. It is also stated that the climate of Wineland was so mild, that "there fell no snow at all, and the cattle were out during the whole winter, and fed themselves," the streams and the sea teemed with fish, and the woods were full of deer, and when the Norsemen first came there they did nothing but amuse themselves, etc.

The general ideas of the Fortunate Land, or Isles of the Blest, far out in the ocean in the west, were exactly similar. Pliny describes the lofty trees of the Fortunate Isles; already in the *Odyssey*, we hear about the Elysian Fields in the west on the borders of the earth:

> "There is never snow, never winter nor storm, nor streaming rain,
> But ocean ever sends forth the light breath of the west wind
> To bring refreshment to men."

And the fortunate isle of Syria towards "the region where the sun sets" was "rich in oxen and sheep, and clothed with *vines* and *wheat*."

Diodorus of Sicily also describes a land opposite Africa in the middle of the Atlantic Ocean as unusually fertile. It invites to amusements and delights. It has thick forests and all kinds of fruitful trees, and many streams, there is game of all sorts, big and small, and the sea is full of fish. The air is extremely mild, and there is plenty of fruit the whole year round, etc. That is, it is just like Wineland. The

land was not known in former times, but some Phœnicians, on a voyage along the African coast, were overtaken by a storm, were driven about the ocean for many days, until they came thither, just like Leif Ericson.

Horace, in one of his *Epodes* [XVI., 39 ff.], exhorts the Romans, who were suffering from the civil wars, to abandon the coast of Italy, and sail from all their miseries to the happy land, the Fortunate Isles in the West.

> "Lo! where awaits an all-circumfluent ocean—
> Fields, the blest fields, we seek the golden isles,
> Where teems a land that never knows the ploughshare,
> Where, never needing pruner, laughs the vine."

We see the same ideas, the happy land "where the untilled earth, not knowing the ploughshare, gives corn every year, and the vine uncut (*i.e.* growing wild) continually flourishes." Can we be in doubt that it is the same land, the happy land in the west, which is here described as well as in the Icelandic sagas?

Is it not the same happy land far out at sea, west of Ireland, the Tir na n-Og or Tir na m-Beo, the Land of Youth, the Land of the Living, which calls the Irish seafarer?—

> "Come dwell in our island, come live in those bowers,
> Which sorrow and care never gazed upon yet;
> Where true love rears altars, encircled with flowers,
> The fairest and sweetest the eye ever met,
>
> "Whose skies are unclouded, whose fountains are flowing,
> With no icy chill on their soft gushings cast;
> And hearts that inhabit, like the buds round them blowing,
> Bloom on in their freshness, unchanged as the past!"

Yes, it is the land of happiness, which the human mind of all ages dreamt of but which was never reached.

But now how came these ancient tales of the Fortunate Isles, originally grown under a warmer sun, to Iceland, the isle of mists in the north ocean?

There are several possible ways. The nearest way might appear to be that they have got their ideas about Wineland from Adam of Bremen's description of the northern islands. It is, however, somewhat doubtful whether this work was known in Iceland in the thirteenth century.

Then the Icelanders may have taken their description directly from Isidorus Hispalensis. This seems to be very probable, especially as Isidore was well known in Iceland, and we even possess old Icelandic translations of parts of his work. We thus get a natural explanation of the striking resemblance between the description of Wineland and Isidore's description of the Fortunate Isles.

But there is still a third way, which has evidently been of much importance, and that is through Ireland.

As is well known, Norway, and still more Iceland, were closely connected in ancient days with Ireland, and the Norse-Icelandic literature shows in many ways traces of Irish influence. In the old Irish legends there is a whole world of such fortunate islands in the western ocean, which have names very similar to that of Wineland, and which, to a large extent, are derived from the classical myths of the Elysian Fields and the Fortunate Isles. Voyages to them form prominent features of most of the Irish tales and legends. There is "Ciūin" (*i.e.* the mild land) with riches and treasures of all colours where one listens to lovely music and drinks the most delicious wine, "Mag Mon" (the plain of sports): "Imchiūin" (the very mild land): "Mag Mell" (the happy plain, the Elysian Fields of the Irish) where, without sin, without crime, men and loving women sit under a bush at the finest sports, with the noblest wine, where there is a splendid wood with flowers and fruits and golden leaves, and the true scent of vine. There is "Hy Breasail" (or "O'Brazil"), whose name is evidently derived from the Irish word "*bress*" meaning good fortune, success, prosperity. This name is consequently a translation of the name Fortunate Isles. There were also many others.

It is said in the ancient tale of Bran's voyage towards the west (*Echtra Brain maic Febail*), that "there are thrice fifty distant islands in the ocean to the west of us, each of them twice or thrice as large as Erin."

The "Promised Land" (Tir Tairngiri) with the "Happy Plain" (Mag Mell) became in the Christian Irish legends the earthly Paradise, "Terra Repromissionis Sanctorum" (the land of promise of the saints), which St. Brandan went in search of. There was also the "Insula Deliciosa" (the delicious or good island), and even a "Terra Bona" (the good land). Many of the islands in the distant west were inhabited by the mythical sid-people, who have resemblances to the Skrælings of Wineland.

There seems to me to be little doubt that there is a close connection between these Irish legends and the Icelandic tales of voyages to Wineland and the other lands in the west.

Let us now consider the strange name "Wineland the Good," and what it may mean. The origin of the first part of the name, Wineland, may not seem so very difficult to explain, when we consider what an important feature the vine forms in all descriptions of the Fortunate Isles, even in the classical legends, and still more in the Irish ones. Wine, in addition to women, was for the old Irishmen a most necessary feature in their ideas of happiness, and decidedly not less so for the Norsemen. It was, moreover, no northern product, but came from the south, along with wheat, and was to the northerner, above all others, the most striking proof of the fertility of the south. No wonder, therefore, that when he wished to describe a specially fertile land where perpetual happiness dwelt, he should call it Wineland. So we see is also the case in the Irish legends. In the legend of St. Brandan (*Navigatio Sancti Brandani*), he and his brethren, roaming the western seas, came to a remarkable fertile Isle of Grapes ("Insula Uvarum"), far west. "It was

covered with the thickest forests of vines, which bore grapes with such incredible fertility that all the trees were bent to the earth."

This legend was written down in the eleventh century, probably about the same time when we first hear of the Norse Wineland in Adam of Bremen (about 1070), and the legend was also well known in Iceland, where even translations of it were made. "Insula Uvarum," or the Isle of Grapes, translated into the old Norse, could not very well become anything but Vinland (Wineland), or also Viney (Wine-island). But considering the existence of the other names, Iceland and Greenland, it was quite natural that the former name was preferred.

We thus have the remarkable circumstance that an island with the same name and the same properties makes its appearance almost simultaneously in Ireland and in Denmark, where Adam heard it, but whither it may have been brought by an unknown Icelander, as there is good reason to believe.

That these Wine-islands or Winelands should have originated entirely independent of one another, in countries which had such close intellectual connection, would be a coincidence of the kind that one cannot very well assume, since it must be regarded as more probable that there was a connection. It must be remembered that Ireland was still inhabited by a great number of Norsemen at that time.

But Brandan's Grape-Island can scarcely be derived from a Wineland discovered by the Norsemen, since the wine and wine-fruit play such a prominent part in the older Irish legends of the lands in the west, as has already been mentioned. It therefore becomes probable that the Norse name Wineland was originally derived from Ireland, as is also actually indicated by the Icelandic literature, the Landnámabók, where Wineland is said to be near Great Ireland or Hvítramannaland, the tale of which with certainty came from Ireland; and Icelanders have evidently heard both lands spoken of there.

That Wineland and the tales of the voyages thither were connected with Ireland is also proved by the story in Eric the Red's saga. I have already mentioned that when Leif Ericson's brother went out from Greenland in search of Wineland he is said to have been carried eastwards so far as Ireland. Considering the great distance across the Atlantic such a statement may seem startling, but it gets a natural explanation if Wineland was originally an Irish fairyland.

North of Wineland were the "Furðu-strandir," *i.e.* the marvel-strands. This name has a striking similarity to the names of the fairy-lands, far in the ocean west of Ireland, such as "Tirib Ingnad" (lands of marvel), and "Trág Mór" (great strand).

After having passed these strands of marvel, one small party of Karlsevne's people, led by Thorhall the Hunter, "was caught by a westerly storm, and they drifted to Ireland, and there they were made slaves and ill-treated. There Thorhall lost his life, as merchants have reported." Of another party of Karlsevne's people, led by Bjarne Grimolfsson, it is told that on their way home from Wineland they were carried out into the Irish Ocean; there they came into the maggot sea, and the ship was worm-eaten and sank. Half the crew saved themselves in the boat, and came to Dublin in Ireland.

It seems to me that there is no other natural explanation of these perfectly legendary tales than that they have come from Ireland, probably with merchants, as is also stated. The ship that is worm-eaten in the maggot sea reminds one of the incident in the tale of the voyage of the three sons of Ua Corra (twelfth century), where the sea-monsters gnaw away the second hide from under the boat.

To any one who is familiar with Norse place-names the addition "hit góða" (the good) to Wineland must appear foreign and unusual. In the northern countries it is otherwise only known from the name "Landegode," originally "Landit Goða," *i.e.* the good land, for an island west of Bodö, in northern Norway, and in earlier time also for two other islands far out at sea on the west and the south coasts of Norway. All three islands were formerly fairylands ("huldre-lande"), and the name was probably a designation of fairylands, which lay out in the ocean, and which were thought to sink into the sea as one approached them.

In the Irish legends there are quite similar ideas of the happy land, "Tir fo-Thúin," the land under the wave, and the "Happy Plain," "Mag Mell," which was invisible to ordinary men, as Bran is told, when he meets on the sea Manannan MacLir (*i.e.* the son of the sea), king of the sea-people, lord of the land of the dead. The Norwegian fairy-people or sea-people corresponding to the Irish sid-people were called "Hulder," which means "hidden" (*i.e.* the hidden people), and the original germ of the belief in such fairies (both in Norway and in Ireland) is the worship of the departed, the hidden people. These fairylands are thus originally the islands of the hidden or of the departed, and are consequently the same as the Fortunate Isles which were originally the Greek Islands of the Blest, or of the departed.

The lands or islands of the departed in course of time became the habitations of the invisible ones (spirits), of those who possess more than human wisdom, and have a specially favourable lot: by this means the idea of a fortunate land with favoured conditions, far surpassing the ordinary lot of men, became more and more emphasised. This development may be followed both with regard to classical ideas of the Fortunate Islands, and to Norse conceptions of fairylands.

The foreign name "Insulae Fortunatae," or the Fortunate Isles, could not very well take any other Norse form than Landit Góða (*i.e.* the good land), which may then be a direct translation. And as in addition the fairylands, both in Ireland and in Norway, were imagined as specially good and fertile, and the huldre- and sid-people or elves are called the "good people," and are everywhere in different countries associated with the idea of "good," this gives a natural explanation of the Norse designation; "the good," both in Landit Góða, and in "Wineland the Good," being evidently a hybrid between the latter name "Wineland" and "Landit Góða," which probably originally is a translation of "Insulae Fortunatae" (the Fortunate Isles).

It might be objected to the view that "Wineland the Good" originally was "the Fortunate Isles," that several sorts of wild grape are actually found on the east coast of North America; it might there-

fore be believed that the Greenlanders really went so far, and discovered these. It has, however, to be considered that it is only comparatively far south in the present Maine, or even farther south, that wild grapes are with certainty known to have occurred along the American coast. And besides, wheat was never a wild cereal in America, and it has not hitherto been possible to find any plant there which could have given the Norsemen their idea of the self-sown wheatfields. No wonder, therefore, that hardly two authors who have discussed this question have been able to agree where on the American coast the Norsemen could have found the conditions described. This is undeniably a very weak point in their defence of the authenticity of the saga. No attempt made hitherto to bring the natural conditions of the coast of North America into agreement with the saga's description of Wineland has been able to afford any natural explanation of the striking juxtaposition of the two leading features of the latter, the wild vine and the self-sown wheat, which are identical with the two leading features in the description of the Fortunate Isles. If it were permissible to prove in this way that the ancient Norsemen reached the east coast of North America, then it might be concluded with almost equal right that the Greeks and Romans of antiquity were there; for they already had the same two features in their descriptions of the Fortunate Isles in the west. Wheat and wine were to the Norsemen foreign substances, which evidently have come together from southern Europe, where we find them in Isidore and many others, and where they were important commercial products, often mentioned together.

Since we have the choice then, it may be more reasonable to assume that the Icelanders got their wine from Isidore, or from the same vats that he drew his from, than that they fetched it from America.

A quite remarkable confirmation of the identity of Wineland and the Fortunate Isles, which in classical legends lay to the west of Africa, and were the African Islands, occurs in the old Icelandic geography, which is known from several manuscripts from the fourteenth and fifteenth century, but which is originally much older. There we read: "South of Greenland is 'Helluland,' next to it is 'Markland,' and then it is not far to Wineland the Good, which some think to be connected with Africa. . . ."

This idea of the connection with Africa seems to have been general in Iceland. We also find it in Eric the Red's saga, where it is said that Karlsevne on his voyage southward in search of Wineland "wishes to go south along the coast (beyond the marvel-strands), and eastwards (evidently towards Africa). He thought the land became broader the farther south it bore." This description has hardly any meaning, unless we assume that connection with Africa is thought of, which made the land extend eastwards. The idea of this connection might seem surprising; but it finds its natural explanation, if Wineland was identical with the Fortunate Isles, and in no other way, so far as I can see. The same idea also appears in Norway. Besides a reference in the *King's Mirror*, the following passage in the *Historia Norwegiae*, relating to Greenland, is of particular importance:—

"This country (*i.e.* Greenland) was discovered and settled by the Icelanders . . .; it forms the end of Europe towards the west, and nearly touches the African Islands. . . ."

It is clear that the name "African Islands" is here used instead of Wineland, in connection with Markland and Helluland, as in the Icelandic geography. But the African Islands (*i.e.* originally the Canary Islands and the Madeira Islands) were in fact the Fortunate Isles in connection with the Gorgades and the Hesperides, and thus we have here a direct proof that they were looked upon as the same.

Most of the other features of the tale of Thorfinn Karlsevne's voyage to Wineland are also in part legendary or borrowed from elsewhere, but it would take much too long a time to go into all this here. Only a few examples may be mentioned.

It has been proved that the ancient Irish tale of Maelduin's voyage in the western ocean (*Imram Maelduin*) has been formed on the model of the Æneid, the model of which is again of course the Odyssey. The legend of St. Brandan's voyage originated chiefly from *Imram Maelduin*.

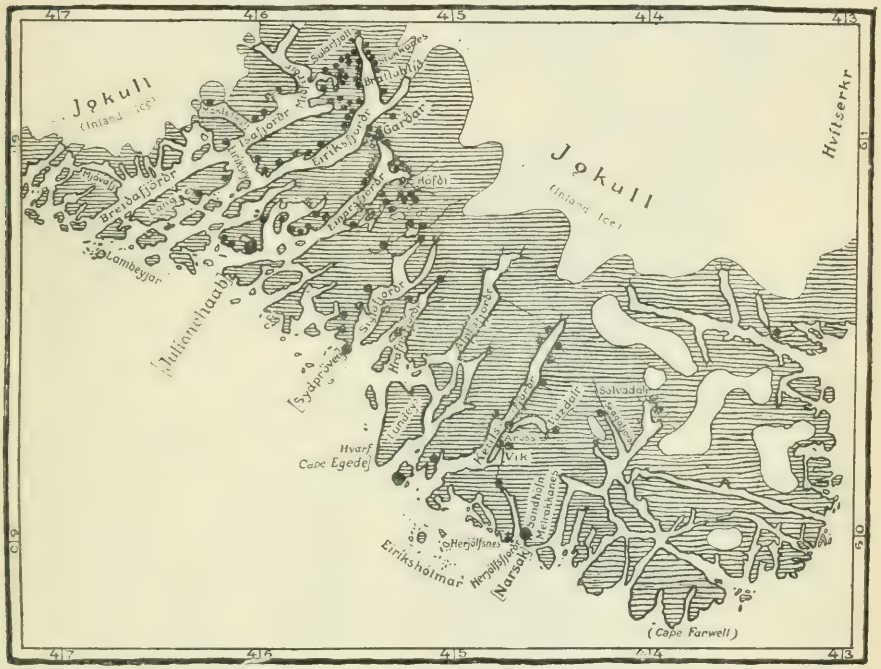
If, however, one compares these tales of voyages to unknown islands in the western ocean with the sagas of the Wineland voyages, it must strike one that there are great similarities in several respects. The Norsemen also go out in search of a Promised Land or happy land, called "Wineland the Good," and they come first to various unknown lands or islands. There are even small unimportant features which show great similarity. During the first wintering of their expedition Karlsevne's people were nearly starving, when a whale of a strange kind, which they did not know, was driven ashore. This resembles the great fabulous fish that is cast ashore, and that Brandan and his brethren live on.

When the natives, the Skrælings, came to Karlsevne's settlement in Wineland, it is said that they came rowing in hide canoes "as many as though it had been sown with coal before the bay." This curious and unintelligible expression seems to find its explanatian in an expression in the Irish tale of Brandan's voyage (*Imram Brenaind*), where Brandan and his companions come to a small deserted land, and the harbour they entered was immediately filled with "demons in the form of pygmies and dwarfs, who were as black as coal."

When Thorfinn Karlsevne and his people were attacked by the Skrælings these threw a strange big and black ball from a catapult. The ball went over the heads of the Norsemen, and made an ugly sound (report ?) when it fell, so that the Norsemen were frightened and fled with all speed.

In the narratives of both Brandan's and Maelduin's voyages the seafarers come to an island where the inhabitants throw fiery masses after them, which pass over their boat and fall farther off in the sea, which begins to boil, etc. They are frightened and fly hastily out into the open sea. This incident is evidently an echo of the classical Cyclops of the Æneid and Odyssey, and the great stones that were thrown at Odysseus.

The statements in the beginning of the tale of Karlsevne's voyages to Wineland are also quite impossible. He begins his voyage by sailing from the Eastern Settlement of Greenland to the Western Settlement. This means to sail from the present district of Julianehab northwards along the west coast of Greenland to the district of Godthab, and he even sails as far as Björney or Bear island, which may be Disco island, in order to sail thence towards Wineland with a northerly wind, which means southwards. The Icelandic author of the tale, not knowing



The Eastern Settlement of Greenland. The black points mark the ruins of the homesteads of the ancient Greenlanders.

(*From F. Jónsson*, 1899.)

Greenland geography, has evidently thought that the Western Settlement must be due west of the Eastern Settlement, and not north of it.

Then Karlsevne sails to three different lands or islands in turn (Stoneland, Woodland, and the Marvel Strands) with the same number of days' sail (two days' sail) between each. Even if we do not take into account the fact that the distances given (two days' sail from Greenland, etc.) are perfectly impossible, it seems clear that this feature must have been taken directly from the fairy-tales, where the hero generally travels to three different lands, with the same number of days between each, and nothing corresponding to such separated three islands is to be found on the coast of America. It is perhaps also more than a coincidence that in the classical legends there were three groups of islands, the Gorgades, the Hesperides, and the Fortunate Isles to the west of Africa.

This part of the description of Karlsevne's voyage reminds one forcibly of many of the old Irish legendary tales of wonderful voyages. In particular, the commencement of *Imram Maelduin* may be mentioned, where the hero also comes to three successive islands with three days' and three nights' sail between each, while after that they sail "a long way," "for a week," "for a long time," etc., to new lands, exactly as in the tale of Karlsevne.

The Western Settlement of Greenland. The black points mark the ruins of the homesteads of the ancient Greenlanders. (*From F. Jónsson*, 1899.)

We thus come to the conclusion that the narrative of the Wineland voyages is a mosaic of one feature after another gathered from east and west.

But is there, then, nothing left that may be genuine? To this it may be answered that even if the romance of the voyages be for the most part invented—to some extent perhaps from ancient lays—the chief persons themselves may be more or less historical, and there are various features in the description, which seem to indicate a certain knowledge of the real conditions in the north-east coast of America.

Incidents such as the bartering of skins with the Wineland Skrælings, and the combat with unfortunate results, seem to refer to something that actually took place: they cannot easily be explained from the legends of the Fortunate Isles, nor can representations of fighting, in which the Norsemen were worsted, be derived from Greenland. They may rather be due to encounters with Indians.

The very mention of the lands, first the treeless and rocky Helluland (Labrador?), then the wooded Markland (Newfoundland?) farther south,

and then the fertile Wineland, may also point to local knowledge: but can be explained away as having been put together from the general experience, that countries in the north are treeless, but become more fertile as one proceeds southwards. The names Helluland and especially Markland have in themselves an appearance of genuineness, as also has Kjalarnes. The surest historical evidence that voyages were made to America from Greenland is the chance statement in the Icelandic annals that in 1347 a ship from Greenland, which had sailed to Markland, was driven by storms to Iceland. This was written down not many years after the event, perhaps only fifteen years later; it may be considered as quite certain that this ship had been to Markland: and this reveals the fact that, occasionally at any rate, this voyage was made: probably in order to fetch wood and timber, which were scarce, and very valuable in Greenland. A prominent feature of the different tales of the Wineland voyages is also that of the Greenlanders bringing timber from thence.

I may still mention another interesting evidence of quite a different kind. Mr. Ebbe Hertzberg has shown that there is a remarkable similarity between that peculiar ball-game of *lacrosse*, which is played by the Indians of the north-east of North America, and the ancient Norse ball-game "knattleikr," which was a favourite game in Iceland according to the sagas. The similarity seems to be perfect even in small peculiar details, which would indeed be difficult to explain unless there had been some connection. This game has a wide distribution among the Indian tribes of Canada and United States, and must have been introduced at an early period. Dr. Hoffmann, who describes it, thinks that it is undoubtedly derived from one of the eastern Alzarkin tribes, possibly in the valley of St. Lawrence. This, then, points to its having originated just in those districts where one would expect it to come from, if it was brought by the Norsemen, as Hertzberg thinks. In support of his view I may also mention that the Icelanders appear to have introduced the same ball-game to another American people with whom they came in touch, namely, the Eskimo of Greenland. According to Hans Egede's description they had a very similar game. If Hertzberg is right in his supposition, as I consider to be probable, this would lend strong support to the view that the Norsemen had considerable intercourse with America and its natives.

The results of these investigations would then be that the Norsemen have discovered America, and have had intercourse with the land and its natives probably during some long period; but the narratives of this discovery and of voyages to Wineland are legendary. The Icelanders and the Greenlanders may have transferred the ideas, especially of the Fortunate Isles, from the legends to the discovered land: and the saga of Wineland the Good has then been gradually formed in the course of time, by putting together feature after feature from old tales and legends, with some such real knowledge of lands in the west. This saga as we know it in the saga of Eric the Red, is, however, written in a masterly way, which we must highly admire. The Icelanders thus created the realistic novel; and at a time when the prose style of Europe was still

in its infancy, their prose narrative often reaches the height of clear simplicity.

It is strange, however, that while in the realistic novel of Wineland, the Fortunate Isles have evidently been intermixed with the discovery of America by the Norsemen, the same happy land far out in the ocean west of Ireland was again the luring goal, when the American continent was rediscovered from England.

"On the ocean that hollows the rock where ye dwell,
A shadowy land has appeared, as they tell;
Men thought it a region of sunshine and rest,
And they called it O'Brazil—the isle of the blest.

"From year unto year, on the ocean's blue rim,
The beautiful spectre showed lovely and dim;
The golden clouds curtained the deep where it lay,
And it looked like an Eden, away, far away!"

It was to find this Fortunate Isle, Brazil, that Bristol sent out expeditions in 1480 and later. It was in search of this island of happiness that John Cabot left Bristol in 1497, and he found the continent of America for England. The great illusions have always played an important part in the history of Mankind.

Note.—The two illustrations in this paper are drawn from Dr. Nansen's book, *In Northern Mists*, and for the use of the blocks we are indebted to the courtesy of Mr. W. Heinemann, the publisher.

THE SCULPTURE OF THE GOAT FELL MOUNTAIN GROUP.

By Frederick Mort, M.A., B.Sc., F.G.S., F.R.S.G.S.

(With Map and Illustrations.)

The interpretation of the scenery of an area is one of the most fascinating problems in science, particularly when the investigator is dealing with a district so impressively beautiful as North Arran. The features of a landscape may be regarded, in mathematical language, as functions of three independent variables, structure, process, and stage. Structure involves what is generally included under the geology of the area—the nature of the rocks, their arrangement, the way in which they have been affected by subsequent movements—all these have an important effect in determining the combination of surface features that we know as scenery. Again, the appearance of the landscape depends on the nature of the processes that have been at work. Wind and water carve in very different ways. Ice-work is totally different from either. Just as in the sculpture of the human figure the classic sweetness and grace of Praxiteles is absolutely unlike the powerful impressionism of Rodin, so in the carving of a landscape, nature's sculptors work each

in his own characteristic style, recognisable at once by the trained eye. Finally, the stage to which the process has been carried is of great importance. If the erosion of an area is in an incipient stage, the forms produced are very different from those resulting from long-continued denudation. The stage at which erosion has arrived is graphically expressed by the American use of the terms youth, maturity, and old age.

The task of the geographer is by examination of the existing landscape to deduce the original structure, to state what agencies have shaped the finished product now before his eyes, and to decide to what stage their operations have been carried. Obviously the task must often be of extreme difficulty, for one agent obliterates the work of another; it resembles the deciphering of a palimpsest which has been written on again and again. Hence, while many deductions may be soundly based, we are reduced at times to mere conjecture.

Goat Fell is the best known of a group of mountains in North Arran, all of which lie within a circle five miles in diameter. Although not a single peak reaches 3000 feet in height, yet by reason of the noble sweep of their outlines, their great precipices and deep valleys, their splintered crests, and the general impression of grandeur produced by the group, they are more worthy of the term mountains than many peaks much superior in actual height. With the exception of Cir Mhor, all the peaks are the culminating points of high and narrow ridges. This arrangement is shown in the map. The ridges radiate out from Cir Mhor in a star-fish-like fashion. To the north runs the ridge of the Castles, swinging to the north-east, and terminating in Suidhe Fhearghas. To the east is the ridge that ends at Cioch na h-Oighe. South-east is the Goat Fell ridge which throws off two easterly spurs culminating in Am Binnein and Meall Breac. South-west from Cir Mhor runs the ridge of A' Chir, which divides into two, the easterly branch forming Beinn a' Chliabhain, the westerly rising into Beinn Tarsuinn and Beinn Nuis. Between these ridges lie deep glens, coires, and passes, which make North Arran a region of inexhaustible attraction to the student of nature or the mountain wanderer. Glen Rosa and Glen Sannox are by far the largest of the glens. The other valleys or coires referred to in the text are shown in the map.

The structure of this district is fortunately very simple. The whole area consists of coarse granite crossed by numerous dykes of igneous rock. Round the edge of the granite there outcrops a band of schists and sedimentary rocks, but all the high peaks and ridges, and the deep valleys and coires occur in the granite. The ridges of this area are extremely rugged and serrated, giving a character of wildness to the scenery found nowhere else in Arran. The hills to the west are much smoother and softer in outline. Sir A. C. Ramsay in his *Geology of Arran* (1841) attributed this difference to the fact that the western area consists of fine granite, which is softer than the coarse, thus presenting smoother outlines, and since his time this explanation has been almost universally accepted.

That the difference in the grain of the rocks has had some little effect

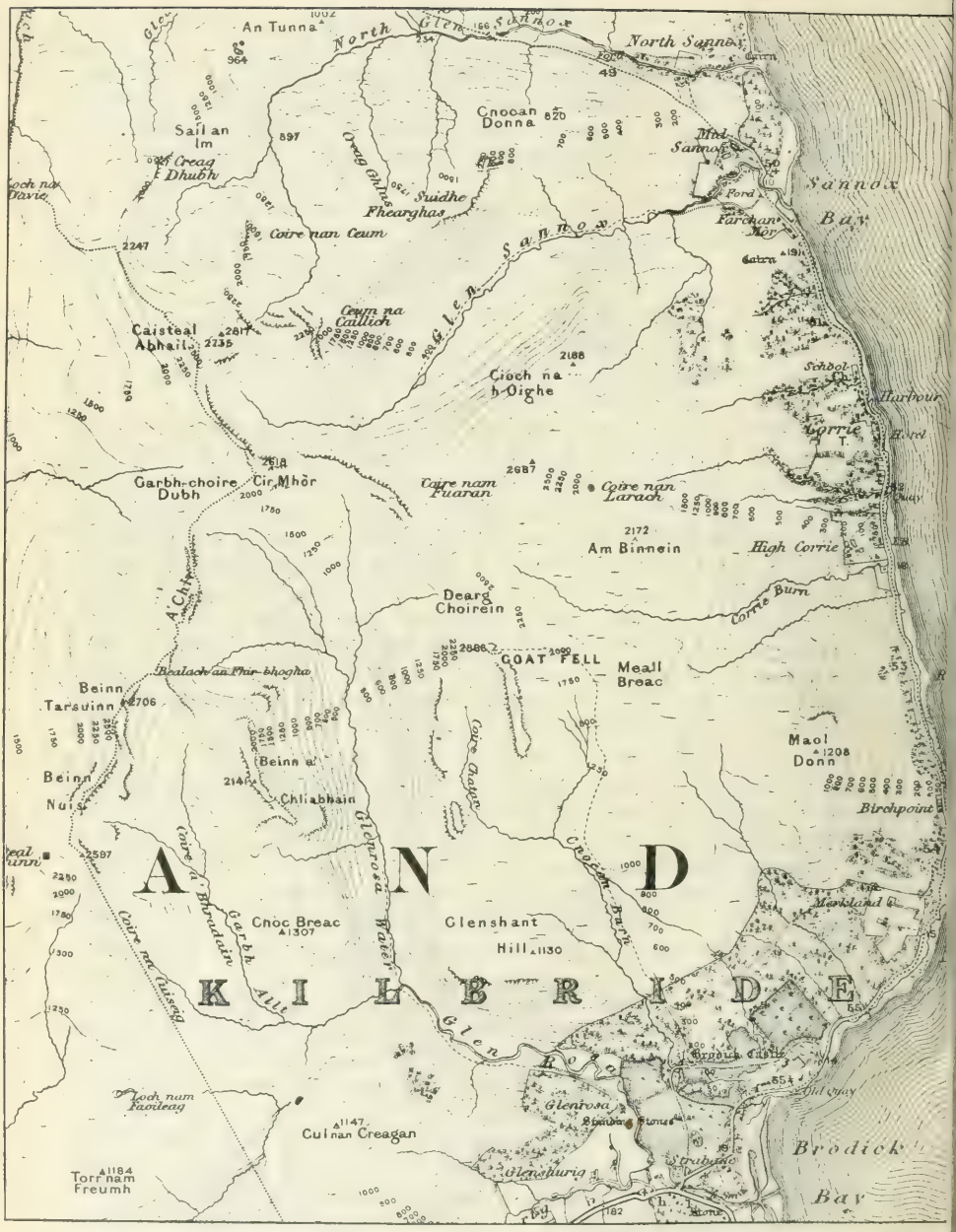


FIG. 1.—Map of the Goat Fell area. Scale one inch to a mile. Reproduced with the sanction of the Controller of H.M. Stationery Office.

may be admitted, but it is by no means the dominating influence. For Meall nan Damh occurs in coarse granite, yet no hill in North Arran is smoother in outline. Beinn Bhreac and Beinn Bharrain are within two miles of each other, they are equal in height, and there is practically no difference in roughness of outline between the two, yet one is in the fine granite, the other in the coarse. The same thing holds for the two peaks of Sail Chalmadale.

The contrast between the gashed, serrated outlines of the Goat Fell group and the tamer scenery farther west is primarily due not to a difference in structure, but to a difference in process, to a difference in

FIG. 2.—Looking up Glen Sannox. The peaks shown are, from left to right, Cioch na h-Oighe, Cir Mhor, the serrated ridge leading to Caisteal Abhail, and on the extreme right Suidhe Fhearghas. (*Geological Survey Collection.*)

the eroding agent at work or in the stage to which the process has been carried. Serrations and peaked contours occur when arêtes or sharp edges of any kind are produced by the carving tool. We know that the Goat Fell group was a centre of independent glaciation, and most of the characteristic features of the scenery of the area are, as we shall see, due to ice-work. When a broad-backed, rounded ridge is narrowed into an arête by glaciation in the valleys on each side, the summit almost invariably becomes gashed into the serrated, Alpine character so familiar in many parts of the Highlands of Scotland.

Two other causes have helped to produce the ruggedness of the Goat Fell group of mountains, the jointing of the granite, and the presence of dykes of igneous rocks. Hardly one of the ridges could be called smooth, yet often on the same ridge there is a sudden increase or diminution in

ruggedness. In many cases this can be traced to a change in the direction of the dominant planes of jointing of the granite. For example, the south ridge and the actual summit of Goat Fell are fairly smooth in outline, but the ridge running north is strongly serrated; and this corresponds to a rapid change in the direction of the dominant joint planes from nearly horizontal to an angle of forty-five degrees and then to nearly vertical. The ridge along the north-west side of Glen Sannox shows the same change. At Suidhe Fhearghas there is no strongly marked jointing, and the outline is fairly smooth. On the other hand, along the jagged, toothed part of the ridge between Ceum na Caillich and Caisteal Abhail the jointing dips at a high angle.

FIG. 3.—Upper Glen Rosa. The mountain at the head is Cir Mhor. The deep cleft of Ceum na Caillich is seen to the right of Cir Mhor. (*Geological Survey Collection.*)

Most of the very deep clefts in the ridges are due to the crossing of a dyke that has weathered out more rapidly than the enclosing granite. Ceum na Caillich (the Auld Wife's Step) is formed by the erosion of a large dyke, as Ramsay long ago recognised. Again, to quote Gunn's words (*Geol. Survey Memoir*), "A' Chir, the most serrated mountain in the island, is the one most traversed by dykes." Yet it must be remembered that dykes and joints occur in the fine granite without producing markedly rough features. Dykes and joints are only potential causes of serration. Before becoming actual causes they must be given a proper locus. They come into play only when crossing sharp arêtes that have been formed by other agents, in this case by the independent glaciation of the Goat Fell group.

In the Goat Fell region, as in other parts of Arran, the hills rise

sharply from a well-marked plateau. This is one of the most remarkable features of North Arran, and yet it has received hardly any notice in geographical or geological literature. It varies from about 900 feet to about 1100 feet above sea-level, but as a rule it is very nearly 1000 feet above the sea, and will therefore be referred to as the thousand-foot platform. In places it is perfectly flat for long distances. Looking from the north spur of the Castles one sees an absolutely level tableland stretching for a couple of miles from An Tunna (1002 feet), past the Clachan (1013 feet), to Torr Nead an Eoin (1057 feet), the surface diversified only by gleaming pools of water. East and south of Goat Fell again the platform is very plainly marked between Maol Donn and

FIG. 4.—Goat Fell from Brodick Bay. In the middle distance the thousand-foot platform is seen running right across the photograph. (*Geological Survey Collection.*)

Glenshant Hill. On the other side of Glen Rosa it envelops the south ridge of Beinn Chliabhain, and then is splendidly developed round the southern slopes of Beinn Nuis. It can be traced also to the west, but there it passes out of the special area at present under consideration. Many of the North Arran lakes (Loch Tanna, Dubh Loch, Loch Nuis, Loch nam Faoileag, and a host of smaller pools) lie upon its surface, their levels in all cases being just over 1000 feet above the sea.

The origin of the thousand-foot platform presents an interesting problem. The only reference to it made in the *Geological Survey Memoir* is as follows: "These rocks (the schists) often occupy a kind of plateau rising to over 1000 feet in the district reaching from Glenshant Hill to Whitefarland." From this remark one might conclude that the platform is a structural feature due to the outcropping of the schists at a uniform

height around the granite. But this is by no means the case. The level surface of the platform is an erosion feature that has been cut in rocks of very different kinds. The plateau is formed not only by the schists but by the Old Red Sandstone, the Triassic rocks, and the granite itself. It marks a former base level of erosion later in time than the 3000 feet base-level from which the Highlands of Scotland have been carved. The thousand-foot platform is pre-glacial, for it is overlaid by boulder-clay and moraine stuff, and has been eroded by the glaciers moving down the main valleys; but it is of later age than the granite, since it is partly carved from that rock. The granite has now been

FIG. 5.—The valley of the White Water (Coire Lan) seen from above. The small stream is a "misfit" in the wide, deep valley. Part of the thousand-foot platform is seen beyond the valley mouth.

demonstrated to be of Tertiary age, so that the platform may be assigned to late Tertiary times.

The drainage of the thousand-foot platform is remarkably immature. The plateau has hardly been touched by stream erosion. Most of it consists of a level marsh, the surface of which is scarcely incised at all by the few streams that cross it. It presents a perfect example of extremely youthful topography, and this also indicates a comparatively recent date of origin. When we consider the total amount of erosion accomplished in Tertiary times we cannot help being convinced that this peneplain must have been formed practically at the close of that epoch. Does the thousand-foot platform represent a peneplain of sub-aerial erosion, or is it an example of a shelf of marine denudation? Formerly all such plateaux were referred to marine action, but in recent years,

following the American school of physiographers, the tendency has been to class them as of sub-aerial origin. In Arran the platform is so level that if it is an old land surface reduced to a peneplain then the stage of the denuding processes involved must have been one of extreme old age, the very end of the cycle of erosion. The profile of the land surface should therefore show a very gentle, continuous curve from the centre to the sea. But this does not agree with the observed facts, for round the inner edge of the platform there is a sudden rise to the mountains of the interior. This is more in harmony with the belief that we are dealing with a peneplain of marine denudation.

The valleys of the Goat Fell mountain group are particularly beautiful. The upper part of Glen Rosa, at the head of which Cir Mhor seems to mount guard, is a splendid bit of composition, while Glen Sannox in some aspects is distinctly grander. The rounded swell of Cioch na h-Oighe (the Maiden's Breast) forms a fine contrast to the splintered ridge that runs past Ceum na Caillich to the Castles. The valleys are deep but widely opened, the cross-profile sweeping

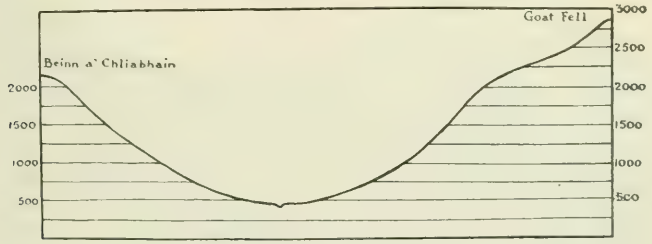


FIG. 6.—Section across Glen Rosa. Vertical and horizontal scales the same. The characteristic catenary curve is well shown.

from one ridge to the other in a beautiful catenary curve. The sides are smooth and uninterrupted by tributary glens. As one ascends a glen to its head the valley sides do not contract as normal valleys should, but rather widen, and the glen ends suddenly in an abrupt, rounded amphitheatre. Towards its lower end a large valley often terminates all at once, the stream cascades openly down a rock-step, and then occupies an incision in the rocks that is quite out of proportion to the deep and wide valley higher up the stream. (See Fig. 7.) The White Water (Corrie Burn of the O.S. maps) and Coire nan Larach are good examples. The tributaries do not join the main streams at accordant junctions, but tumble down the main valley sides from openings higher up, in short they are "hanging valleys."

The wide, main valleys give the observer an impression of harmony and proportion until the actual stream is noticed, when a disturbing sense of incongruity is felt. The valley seems too large for the tiny stream that flows down it; it is a misfit, the disproportion in some instances being almost ludicrous. Can these small streams possibly have excavated the wide and deep valleys in which they flow? Seventy years ago Ramsay seems to have asked himself the same question,

and he suggests that perhaps the material in the glens was softer than the surrounding rocks. Needless to say there is no basis of observation for this hypothesis. If the valleys are due to normal stream erosion then the process must have reached a high degree of maturity, for the valleys are widely opened and flat-bottomed. But the other features that should accompany a mature topography are entirely absent. The tributaries should enter their mains with accordant junctions instead of forming hanging valleys. The rock-steps should long ago have disappeared. The streams should flow in swinging meanders down the flat floors of the valleys. Instead of that they flow with fair rapidity in straight courses, and are cutting young

Fig. 7.—The valley of the White Water seen from below. In its lower course instead of becoming larger the valley practically vanishes. Compare Fig. 5.

valleys in the large, old valley-floors. Increased velocity and consequent cutting power may be due to rejuvenation, but (with an unimportant reservation considered later) this explanation does not apply to the Goat Fell valleys, for in the stage of maturity they must have reached, assuming normal stream erosion, rejuvenation would produce incised meanders such as we find so well developed in the upper Thames basin. The hypothesis, then, that these valleys have been eroded by normal river action completely breaks down. We are forced to the conclusion that they have been excavated by ice. On this theory the peculiar features enumerated are easily accounted for, and many other details of the landscape difficult to understand on any other hypothesis receive a reasonable explanation.

The course of the Rosa Water may be taken as typical of the

larger streams of the Goat Fell area. A section along the river bed is shown in Fig. 8. The first part of its course (until about 1250 feet above sea-level) is in the coire at its head. The step at the mouth of the coire is well shown; it ends approximately 1000 feet above the sea. The gradient although not so steep is still considerable until 600 feet is reached, for the stream up to that point flows in the wide amphitheatre at the head of Glen Rosa. From 600 feet to the sea the river runs along the floor of the valley and the slope is therefore much gentler. One abnormal feature of this part of the stream's course is shown clearly by the diagram—namely, that from 300 feet to about 50 feet the gradient increases. An examination of the glen at this point reveals no apparent cause for an increase of slope. It may with some probability be attributed to a slight rejuvenation of the stream caused by the very recent uplifts that gave rise to the raised beaches of the Clyde area. In fact in its lower

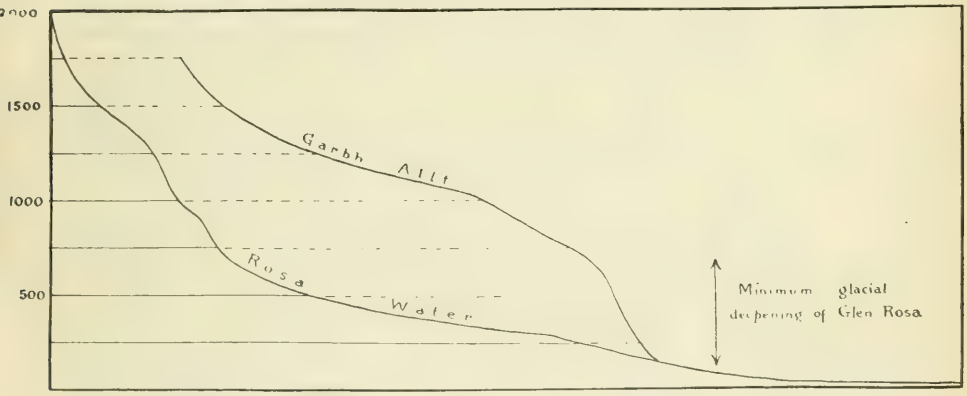


FIG. 8.—Section along the Rosa Water and its tributary the Garbh Allt.

course the river is now actively cutting through the alluvium of the raised beaches.

Fig. 8 also shows the discordant junction of the Garbh Allt with its main river. The steepest part of this stream's course is at its mouth where it joins the Rosa Water. The diagram shows that there is a sudden fall from 700 feet to less than 200 feet. This plainly affords a minimum value for the glacial erosion of Glen Rosa at this point, while the presence of the pre-glacial thousand-foot platform, at this point well developed, fixes a maximum. The pre-glacial junction of the stream must have been between 700 feet and 1000 feet above sea-level, and therefore at this point Glen Rosa has been deepened by not more than 800 feet and not less than 500 feet.

One of the most characteristic features of a glaciated region is the presence of rounded, bowl-shaped excavations known in Scotland as coires (or corries), in Wales as cwms (kooms), and in France as cirques. These almost invariably occur at the heads of valleys, and in addition are frequently found situated on valley-sides or on mountain slopes.

Several good examples occur in the Goat Fell area, perhaps the finest in Arran being the beautiful little coire on the slopes of Cioch na h-Oighe, known locally as the Devil's Punchbowl. A consideration of the direction in which these coires face gives an interesting result. The name coire is often applied to a short, deep, well-opened valley, but limiting the term at present to a detached amphitheatre or a bowl-shaped hollow, we find that in the Goat Fell area there are about ten good examples. Of these ten only one (a small coire on the north ridge of Goat Fell) faces west; the others face north-east or east, that is the direction away from the sun and the warm winds, and most favourable to the accumulation of snow and ice. The same relation obtains in the case of many of the ridges. In general the ridges show a pronounced asymmetry, one side being much steeper than the other. The steep side almost invariably faces in a direction between north and east. This phenomenon is forcibly brought home to those visitors to North Arran who cross from Glen Rosa to Glen Sannox by the col known as the Saddle. The south slope from Glen Rosa is easy, but the Glen Sannox side which faces north is steep and in places dangerous. Fig. 9 shows a rough sketch of the same thing as seen in the Bealach an Fhir-bhogha (the Archer's Pass), and many other examples could be given. It would not be easy to explain facts such as these on any theory but that of ice-erosion.

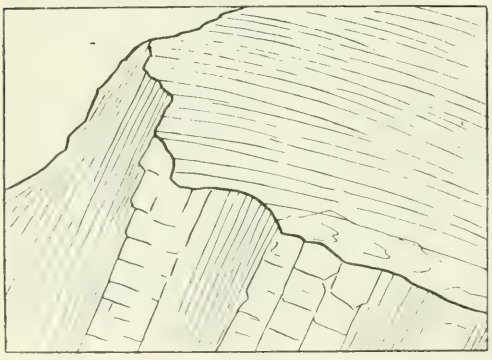


Fig. 9.—View looking east from the Bealach an Fhir-bhogha. The asymmetry of the slopes is very marked. The steep slope faces north.

The phenomenon known as "spur truncation" is frequently encountered in glaciated regions. A valley formed by normal stream erosion is more or less winding, and at the bend spurs run down first from one side of the valley, then from the other. When such a valley is heavily glaciated it is straightened by the less mobile medium which cannot flow round the curves and therefore simply cuts away the ends of the spurs. Truncated spurs of this kind are quite common in the Scottish Highlands, and beautiful examples occur also in Wales. In the Goat Fell region they are rare. Only one fairly good example has been observed by the writer—namely, the ridge that forms the north-eastern extremity of Beinn a' Chliabhain.

In the foregoing pages an effort has been made to show that the surface features of the Goat Fell mountain group have been profoundly modified by ice-sculpture in comparatively recent times, geologically speaking. May there not, however, be some portions of the area left to indicate the contours of the hills before modification? Obviously

where two large glens approach each other the probabilities are that the dividing ridge has been so sharpened that its original appearance has been entirely destroyed. The most likely hill in the area is the ridge running from the north summit of Goat Fell towards Cioch na h-Oighe. On the west this has been rendered precipitous by backward cutting in Coire nan Fuaran, but on the east it is untouched save by Coire nan Larach and the little Punchbowl, which are too small to have produced an arête. At a height of over 2500 feet this ridge is quite unserrated. It is broad, smooth, round, and heather-clad. One is tempted to think that here we have an indication of the nature of the original hill contours before the ice-age had sharpened them into the striking and beautiful forms that we now see. In fact we reach the same conclusion as Professor W. M. Davis in his brilliant essay on the Snowdon group[1]—namely, "that a large-featured, round-shouldered, full-bodied mountain of pre-glacial time had been converted by erosion during the Glacial Period—and chiefly by glacial erosion—into the sharp-featured, hollow-chested, narrow-spurred mountain of to-day."

NOTES ON THE GEOGRAPHY OF THE EDINBURGH DISTRICT.

By James Cossar, M.A., F.R.G.S.

(*With Map and Illustrations.*)

Continued from p. 600.

Climate.

There is a very intimate relation between the configuration of the region and the distribution and character of its climatic phenomena. For our knowledge of the climate we are almost entirely dependent upon the records of the Scottish Meteorological Society and upon the vast amount of data contained in Mr. Mossman's classic paper on "The Meteorology of Edinburgh," from which most of the following figures have been taken. Unfortunately meteorological records are wanting for many parts of the region, but the main facts that have been established for the city of Edinburgh can be applied with local modifications to most of the area.

The controlling factor in the climate of the region is the direction and character of the prevailing winds. As appears from the following table of the mean percentage frequency of the winds throughout the year, deduced from the means of a hundred years, the prevailing winds in Edinburgh are from the west and south-west; 66 per cent. are

[1] "Glacial Erosion in North Wales." By Prof. William Morris Davis. (*Quart. Journal Geol. Soc.*, vol. 65, 1909.)

westerly winds (including S., S.W., W., and N.W.), while only 34 per cent. blow from the east (including N., N.E., E., and S.E.).

N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm or Var.
4	7	16	7	6	17	32	7	4

In the spring and early summer months, however, the east winds are most prevalent, and in April form 47 per cent. of the total for the month, in May 52 per cent., and in June 42 per cent. On the other hand, in December, January, and February the percentage of east winds falls to 25, 26 and 26 respectively, when the west winds reach their maximum frequency.

In the following table is given the number of days during the period 1857-1900 on which the wind blew from each direction, and in addition the percentage of those days when the winds were accompanied by gales, fog, snow or hail. It is scarcely necessary to remark that in some cases these figures must be regarded only as an approximation to the truth on account of the non-instrumental character of the phenomena to which they refer.

	N.	N.E.	E.	S.E.	S.	S.W.	W.	NW.	Calm or Var.
Number of days on which the wind blew,	742	1114	2542	938	979	2118	5649	1322	667
Percentage of those days when *Gales* occurred,	1·6	4·5	2·6	2·9	6·5	15·1	8·6	2·9	...
Fog, . .	3·1	9·9	12·5	9·3	5·0	1·5	1·1	2·0	14·1
Snow, . .	21·5	25·6	16·5	13·5	6·1	3·4	6·6	12·2	5·8
Hail, . .	6·2	6·0	2·3	1·0	0·5	1·3	2·1	4·2	1·3

Note.—The percentage frequency of snow has been calculated for the months November to April only, and not as in the other cases for the twelve months of the year.

Thus it appears that gales are most frequently associated with west and south-west winds, but while much fewer in number, the gales from the north-east are sometimes the more disastrous, especially to the shipping along the coast, and in this connection the situation of a harbour in relation to the prevailing winds becomes of the first importance.

Again while the rainstorms, of which two occur on the average throughout the year, are most frequently associated with winds from the North Sea, the westerly winds are the rain-bearers of the region. These winds, blowing up the valley of the Clyde or across the Southern Uplands, impinge on the mass of the Pentland Hills and are there deprived of much of their moisture. Consequently before descending to the Midlothian basin, lying to the leeward of the hills, they become comparatively dry winds. The same is in a measure true of the winds blowing across Polkemmet Moor and the Bathgate Hills, which have to descend five or six hundred feet before reaching the border plain lying to the north and west of the Pentland Hills. The rainfall map bears out the close correspondence that exists between the isohyetal and the contour lines (Fig. 14). For most of the data upon which the map has been compiled the writer is indebted to the Secretary of the Scottish

Meteorological Society, Mr. A. Watt, M.A., F.R.S.E., who not only gave him access to the records of the Society, but also very readily placed the results of his own valuable labours on the rainfall of Scotland at his disposal.[1]

The main facts to be noted in the distribution of the rainfall are the dry coastal strip, where the average annual precipitation is less than 30 inches, the steady increase in the amount of rainfall with increasing elevation, the effect of the Pentland Hills upon the rainfall of the area

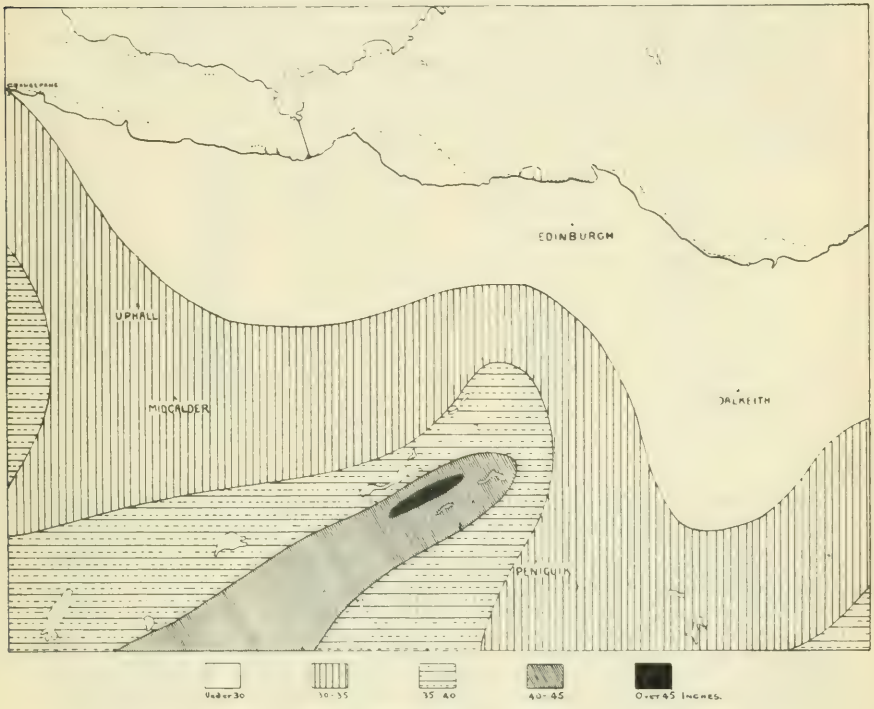


FIG. 14.—Mean Annual Rainfall.

to the leeward, and the heavy rainfall to be found within the 1000-feet contour.

The scale of the map is too small, and unfortunately the stations are too few to illustrate the effect of the minor features of the topography upon the amount of precipitation, but it seems likely that the isolated crags and ridges which are scattered throughout the lowland area exert a marked though local effect upon the climatic phenomena. Thus the average annual rainfall at Corstorphine, situated on the windward side

[1] Reference should be made to the important paper which Mr. Watt has just published in the *Journal* of the Scottish Meteorological Society on "The Mean Annual Rainfall of Scotland, 1871-1910." It contains the statistics for nearly 600 stations, and the beautiful coloured map by Messrs. Bartholomew and Co., which accompanies it, should prove indispensable to teachers of practical geography. The map, with or without reprints of the paper, may be obtained at the S.M.S. Rooms, 122 George Street, Edinburgh.

of Corstorphine Hill, for the years 1900-1908 was 29·4 inches, while at Davidson's Mains, on the leeward side, the mean for the same period was 27·0 inches.

From the geographical point of view the seasonal distribution of the rainfall is of the utmost importance. The following table gives the mean rainfall at Edinburgh for each month, deduced from the records of over one hundred and twenty years, and in order to illustrate the connection between the amount of rainfall and the prevailing winds the mean percentage frequency of the winds for each month is added. The percentage has been derived from the decennial means for the period 1764-1896; under east winds are included N., N.E., E., and S.E., the other directions being embraced under west winds; calms and variables have been excluded.

Month.	Mean rainfall. inches.	Percentage frequency of wind. E.	W.
Jan.,	1·95	29·1	70·9
Feb.,	1·07	29·5	70·5
Mar.,	1·53	38·3	61·7
April,	1·49	47·5	52·5
May,	1·90	51·4	48·6
June,	2·17	42·3	57·7
July,	2·81	34·6	65·4
Aug.,	2·80	31·0	69·0
Sept.,	2·40	33·5	66·5
Oct.,	2·52	30·3	69·7
Nov.,	2·38	29·9	70·1
Dec.,	2·21	28·4	71·6
Year,	25·85	35·6	64·4

The rainfall of Edinburgh is distributed over 161 days on the average, the wettest months being July, August, and October, the driest April, March, February, and May. It is noticeable that in three of the latter months the east winds attain their maximum.

The period of maximum precipitation varies throughout the region. Inveresk has a slightly heavier rainfall in October than in July or August. At Colinton, Swanston, Clubbiedean, and North Esk Reservoir the maximum amount is recorded in January; while October appears to be the month of greatest precipitation at Glencorse, Harlaw, Colzium, and Cobbinshaw. Throughout the lower parts of the region September is generally a drier month than either August or October, and this fact, combined with a fall in temperature, is of considerable importance to the agricultural operations of the month. On the other hand, the heavy rainfall of October in the higher and colder parts of the district—for example, in the vicinity of Cobbinshaw—may seriously interfere with the late harvest.

From the table showing the relation of the winds to various other phenomena it can be seen that the snowfall of the region is most frequently associated with the polar winds; but when blowing across the snow-covered Southern Uplands and the Pentland Hills the westerly winds may exert an important control upon the temperature of the region. The influence of the winds upon the temperature can be established by a comparison of the statistics of the various phenomena, but it may suffice to illustrate this point by one or two extreme cases.

In the first column of the following table is given the mean temperature for each month of the year throughout the period 1764-1896; in the next three columns are given the mean monthly temperatures for the years 1854, 1887, and 1798, when the west winds formed 79·1 per cent., 77·8 per cent., and 76·2 per cent. respectively of the total for the year: the last three columns give the mean monthly temperatures for 1768, 1829, and 1816, in which years the east winds formed 47·5 per cent., 47·3 per cent., and 46·0 per cent. respectively.

	Mean Temp. 1764-1896.	1854 79·1 W.	1887 77·8 W.	1798 76·2 W.	1768 47·5% E.	1829 47·3% E.	1816 46·0% E.
Jan.,	36·8° F.	**36·9° F.**	**39·2° F.**	**38·4° F.**	*33·2° F.*	*32·1° F.*	*35·4° F.*
Feb.,	38·3	**39·9**	**39·7**	**38·9**	*38·2*	**38·8**	*35·8*
Mar.,	40·3	**45·3**	*39·2*	**40·6**	*40·2*	*39·6*	*36·4*
April,	44·8	**46·4**	*42·8*	**49·8**	**46·5**	*41·9*	*40·9*
May,	49·9	**50·9**	*49·1*	**53·3**	**52·5**	**51·6**	*48·2*
June,	55·7	**56·5**	**58·5**	**68·8**	*54·5*	**56·3**	*53·2*
July,	58·6	**59·6**	**61·3**	**60·6**	*58·3*	*56·5*	*55·7*
Aug.,	57·8	**60·5**	**58·1**	**59·4**	**58·7**	*54·0*	*55·6*
Sept.,	53·6	**57·0**	*52·6*	**54·9**	*51·0*	*50·3*	*50·9*
Oct.,	47·2	**47·9**	*45·1*	**48·2**	*47·0*	*46·0*	*46·3*
Nov.,	40·9	**42·0**	*38·8*	*39·0*	*40·1*	*39·6*	*38·5*
Dec.,	38·3	**39·9**	*36·8*	*35·8*	**39·1**	*36·0*	*35·2*
Year,	46·8	**48·6**	46·8	**48·3**	*46·5*	*45·2*	*44·3*

The general connection between the west winds and the temperature of the region is also borne out by the diagrams which Mr. Mossman has drawn to show the departure from the average of the various climatic phenomena throughout a period of 125 years. Where there is a defect or an excess in the prevalence of the west winds there is usually a corresponding defect or excess in the temperature. On the other hand, a defect in the prevalence of the west winds is generally accompanied by an increase in the number of snowfalls.

From an agricultural point of view the close relation between temperature and altitude is of even greater importance. The accompanying diagram illustrates this relationship in the case of three stations: Leith, which stands practically at sea-level; Rosewell, at an elevation of 690 feet; and North Esk Reservoir,

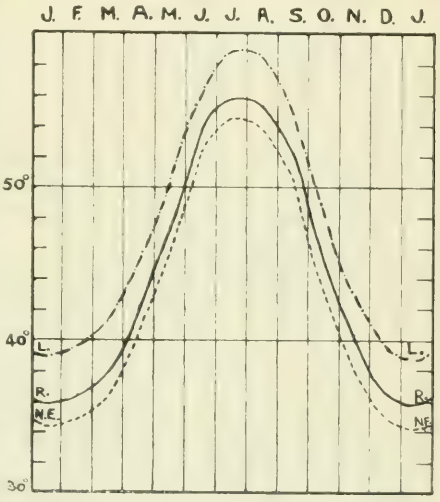


FIG. 15.—Influence of Altitude on Mean Temperature.

in the extreme south of the region, at a height of 1150 feet. While the difference in the average temperature for the year is notable, it is that of the July temperatures which is the most vital to the agriculture of the area.

With the statistics of the mean temperature at Edinburgh it is interesting to compare the figures showing the mean amount of sunshine for each month. While it is unsafe to argue about the amount of sunshine of the surrounding country, for which there are no available data, from the statistics for a smoke-covered town, the danger is less in the case of Edinburgh than in that of most other cities of a similar size.

	J.	F.	M.	A.	M.	J.	Jy.	A.	S.	O.	N.	D.	Year
Mean number of hours of bright sunshine recorded during the period 1891-1900, .	32	62	104	132	170	146	148	140	109	82	38	22	1185
Mean percentage of total possible sunshine, .	15	23	28	31	34	28	28	30	29	26	15	10	26

It is to be noted that the highest percentage of the total possible sunshine is recorded during the month when the east winds attain their maximum frequency. Apart from its connection with the temperature of the area, the amount of sunshine is a factor of some importance from the industrial and commercial point of view, as well as from that of health. In both connections also the amount and prevalence of fogs are important considerations, and in both respects it will probably be found that Edinburgh is very favourably situated.

Vegetation and Agriculture.

In his *Botanical Survey of the Edinburgh District* the late Mr. Robert Smith divided the area into three zones—the littoral, the temperate, and the sub-alpine, and reference to his map of the vegetation will show that these zones correspond to well-marked physical and climatic divisions. The first zone consists of a very narrow coastal strip which is steadily being diminished by the extension of artificial works along the coast. The second zone is the most extensive and the most important from the geographical point of view; it is the zone of cultivation extending from the shore-line to an altitude of about 1000 feet. Between sea-level and the vicinity of the 500 contour line, and roughly limited by the isohyet of 32 inches, lies the belt of profitable wheat cultivation. But within this area there are considerable differences in the time of ripening and the quality of the grain. It has been noted in the *New Statistical Account of Scotland* that in the parish of Liberton the agricultural operations in the lower and warmer districts are usually a fortnight earlier than in the higher farms, although the difference in altitude is less than 300 feet. A similar difference is to be noted in passing from the east to the west of the region, and from north to south. This differentiation in the ripening of the crops, apart altogether from the advantages which an early market gives to the more favourably situated farms, was of considerable

importance to the bands of harvesters who before the advent of the self-binder came to the district during harvest, and did much to stimulate the trade of places in which they temporarily settled. Arriving during the last fortnight of August they could find employment until the first weeks of October, and their progress from east to west and from coast to uplands corresponded with marked climatic differences throughout the region.

As the upper limit of the wheat belt is reached the conditions for the cultivation of this cereal become less favourable, and its place is gradually taken by the oat crop. Oats are grown in isolated and sheltered patches above the 900 contour on the northern side of the Pentlands, but with a southern exposure the crop thrives at a much higher altitude and can even be found above the 1250 contour. At present a small patch is being brought under cultivation at Eastside, between the East and West Kip, at an elevation of about 1400 feet.

At Threipmuir, above Balerno, at Listonsheils, where the parishes of Penicuik, Currie, and Midcalder meet, and near Harburn on the northern slopes of the Pentlands, and towards Leadburn on the opposite side, signs of cultivation begin to disappear, and above the region of cultivation there lies the third zone, of hill pasture and moorland. This part of the district is almost devoid of human settlement, and the only signs of the presence of man are furnished by the sheep drains and the grouse covers, or the lone home of the waterman by the side of the reservoirs.

The following table shows the connection between the various zones of vegetation and the factors of altitude and climate :—

Region.	Place.	Altitude in feet.	Mean July Temperature.	Annual Rainfall.
				"
Wheat.	Leith,	70	58·2	26·08
	Inveresk,	90	58·2	28·93
	Dalkeith,	190	58·0	24·55
	Edinburgh,	276	58·1	26·71
Upper region of cultivation.	Rosewell,	690	56·1	32·78
Limits of cultivation,	North Esk Reservoir,	1150	54·5	38·21

The division of the area into its tree regions roughly coincides with that made between the zone of cultivation and the sub-alpine region. The acreage under woods at various dates is shown below :

	1812	1872	1905
Midlothian,	20,400	10,320	12,336
Linlithgow,	6,240	4,719	4,865

But very little of this area consists of natural woodland, the artificial character of the plantations being especially prominent in the vicinity of Redford. The most densely wooded parts of the district are to be found along the valley of the Esk, in the estates of Dalmeny and Hopetoun, and on many of the intrusive crags and ridges scattered over the region. A considerable amount of planting has been carried

out within recent years, for example, in the neighbourhood of Rosewell, but whether this will prove sufficient to counteract the great depletion of the timber area, chiefly to meet the demands for pit props created by the opening up of new mines, or how much of the present waste land could be successfully afforested and made to contribute a supply of wood pulp for the paper-making industry or of building material, cannot be discussed here, although such problems deserve the attention of the expert.

An analysis of the agricultural returns for 1910 shows that 34 per cent. of the county of Midlothian is arable land, and 19 per cent. is under permanent grass. The arable land in Linlithgow forms about 45 per cent. of the total area of the county, and 30 per cent. of it is under permanent pasture. In Midlothian 39 per cent. of the land under the plough is devoted to the cultivation of corn crops, and 36 per cent. to clover, sainfoin, and grasses under rotation. Potatoes and roots are grown on 21 per cent. of the cultivated area. In Linlithgow corn crops are raised on 41 per cent. of the arable land; 38 per cent. is under clover, sainfoin, and rotation grasses: while roots and potatoes are raised on about 17 per cent.

An examination of the statistics of the yield per acre establishes the fact that in the cultivation of the leading crops the district shows a remarkable superiority. In the following table the average yield per acre over the decennial period 1900-1909 is given for each county, and also in order to facilitate comparison for Scotland and Great Britain :—

	Wheat.	Oats.	Barley.	Potatoes.	Turnips and Swedes.	Hay from Clover, Sainfoin and Rotation Grasses.
	Bush.	Bush.	Bush.	Tons	Tons	Tons
Midlothian, . .	46·5	43·1	43·9	7·8	19·5	59·8
Linlithgow, . .	43·5	43·5	43·6	7·4	18·4	59·6
Scotland, . .	39·2	37·1	35·6	6·2	16·1	32·4
Great Britain, .	31·5	39·9	33·3	5·9	14·2	29·9

In the cultivation of wheat and barley the two counties are the most productive in the kingdom, but it is in the yield of hay from rotation grasses that the Lothians show the most remarkable superiority. It is one of the most remunerative crops on account of the steady demand created by the large number of horses engaged in the transport trade of the capital, and also in order to furnish a winter food-supply for the cows in the Edinburgh dairy farms.

In Midlothian there are just over a thousand agricultural holdings, and in West Lothian they number almost five hundred, varying in size according to their situation and to the uses to which they are put. In the upland region one or two of the farms exceed 400 acres: in Linlithgow 6 per cent. of the holdings are over 300 acres, and in Midlothian 11 per cent.: in both counties a considerable proportion of the farms range from 50 to 300 acres, but in Midlothian 46 per cent. of the total number are less than 50 acres, and in Linlithgow such holdings form 25 per cent.

In Midlothian there are at present 109 holdings of less than five acres in area. A considerable proportion of the smaller holdings consist of market-gardens and nurseries, situated chiefly in the immediate neighbourhood of the capital within easy reach of the market it affords for their produce. Such holdings are not separately classified in the official returns, but in 1910 nearly 300 acres in Midlothian were under small fruit and fruit-trees; 66 acres in Linlithgow were put to the same use. To these figures there falls to be added a considerable acreage used for growing culinary vegetables.

For the cultivation of flowers and table-plants of all kinds, Edinburgh possesses several geographical advantages, and this explains the large number of extensive nurseries to be found in the neighbourhood of Liberton, Inveresk, Granton, Morningside, and all along the southern slopes of Corstorphine Hill. An important addition has recently been made to their number by the transference from Rothesay of the Royal Scottish Seed Establishment, which now occupies a large area of land between Edinburgh and Portobello. The moderate rainfall of the district, the temperature, the amount of sunshine and the soil are well adapted for the cultivation of hard-wooded plants, like roses, as well as for dahlias and chrysanthemums. The conditions suit the proper ripening of the wood, and plants grown under such influences have every prospect of thriving when transplanted. The chief enemy of the Edinburgh nurserymen, however, are the strong and persistent west winds, which are specially injurious to tall-growing crops; and for this reason the protection of a dyke or a line of trees against the force of the wind becomes almost essential.

In addition to its advantages of climate and soil the capital furnishes an extensive market for the produce of the nurseries, and also provides excellent transport facilities both for the importation of material, such as bulbs from the Netherlands, and the despatch of seeds and plants to all parts of the kingdom.

An experiment of the greatest interest and importance from the geographical as well as the social and economic point of view is at present being carried on under the auspices of the Edinburgh Distress Committee. Faced with the problem of providing work for the unemployed without taking it away from those already employed, the Committee in 1908 purchased an estate at Murieston, adjacent to Newpark Station, about fourteen miles south-west of Edinburgh. The estate stands at an elevation of 500 feet and comprises about 200 acres, of which three-fourths are available for cultivation: the land had been used for grazing purposes, the bulk of it being of poor quality and valued at about 7s. 6d. per acre, while the best of it was not worth more than 22s. 6d. per acre.

A somewhat unusual method of reclamation was undertaken. Instead of being drained in the ordinary way the land was deeply trenched; above its clay subsoil was spread a thick layer of city refuse, of which large quantities were obtained by rail from the capital: the top soil covering was similarly manured. The clay subsoil forms a natural reservoir at a depth of two and a half feet below the surface, and, as has

been proved during the present year, is likely to be a valuable asset during a dry season. So far only the land of poor quality has been treated, but already 100 acres have been reclaimed and divided up into small allotments which are let at an annual rent of £4, 10s per acre. Not only has the value of the land been increased to thirteen times its former worth, but whereas the whole estate could only provide employment for one or two men when it was used for grazing, every acre of it can now furnish work for at least one person. Thirty pounds per acre have been obtained for the cabbages grown on the reclaimed land, and it has been possible to raise good crops of small fruits from the more favourably situated allotments. Some of the produce reaches the Edinburgh market, but, largely owing to the abnormal conditions of the recent summer and the consequent scarcity of vegetables in some parts of the country, a demand arose on the London market for the produce of the Murieston estate, which was scarcely affected by the drought on account of the supplies of moisture in the clay subsoil. The most perishable stuff was forwarded by rail from the adjacent station, while the less valuable was sent by steamer from Leith. There is every reason to think that this connection between the Murieston growers and the London merchants will be maintained. How far similar methods of land reclamation are applicable elsewhere cannot be discussed here, but the bearing of such an experiment on questions of food-supply, labour, the distribution of population and occupations, is of great significance.

For his paper on "The Geology, Agriculture, and Meteorology of the County of Midlothian," first published in 1879 and revised in 1895, Mr. Ralph Richardson compiled a very instructive map showing the annual value per acre of the agricultural land throughout the county. It revealed a very close connection between the various factors of geological structure, topographical features and climatic conditions and the agriculture of the region. The land of lowest agricultural value is of course to be found in the upland region, while there is a steady increase in the value from upland to lowland and from south to north, the maximum being reached in the immediate neighbourhood of Edinburgh. For the remarkable superiority of the land in the vicinity of the capital there are several reasons. The small rainfall, the natural fertility of the soil, the abundant supplies of manure to be obtained from the city, the proximity of a good market have combined with the energy and intelligence of the farmers to make this part of the district one of the most valuable agricultural areas throughout the country. But it may be noted that when a systematic scheme of cultivation was first undertaken even this area was not without its difficulties in the way of reclamation. Besides throwing an interesting light upon the agricultural methods of the time, the following quotation from a farmer's statement in Robertson's report [1] on the agriculture of Midlothian, written at the close of the eighteenth century, illustrates the intimate connection between the geological processes of the past and the life of the present. In describing

[1] *General View of the Agriculture of the County of Midlothian.* By George Robertson. 1795.

his attempt to reclaim part of Gogar Moor, which was at that time (1780) overrun with furze and interspersed with water-logged hollows, a farmer at Ratho writes: "I ploughed as deep as possible with an uncommonly strong Scottish plough, drawn by two oxen and four stout horses, attended by three men (besides the ploughmen and the drivers) to assist in turning over the furrow, which sometimes fell back, and to throw upon the surface the large stones loosened by the plough, which would otherwise have been buried under the next furrow. I marked the sit-fast stones discovered by the plough and employed men to dig and raise them out of the ground with long levers armed with iron: and when they could not be got out in this manner, to bore and blow them up with gunpowder."

Another factor that tends to raise the agricultural value of the land round Edinburgh is the demand for land for market-gardens and nurseries and also for grazing purposes, either for fattening cattle for the Edinburgh meat market or for dairy farms, of which there are a great number in the neighbourhood. In this connection it is interesting to note that the most highly rented agricultural lands are the meadows of Craigentinny, between Leith and Portobello. Although they are rapidly diminishing in area, owing chiefly to the encroachments of the builder, these meadows were at one time a worthless sandy tract covering about 300 acres. By the application of the sewage of the city by means of an inexpensive system of irrigation this tract was transformed into rich grass land from which five crops of excellent quality can be taken annually. On one occasion £44 per acre were paid for the meadows, and on Mr. Richardson's map their value was given as from £20 to £40 per acre. In the report already referred to mention is made of still another advantage possessed by the lands near Edinburgh for grazing purposes, for "from the great quantity of smoke constantly hanging over them the grass is not only more plentiful, but comes earlier and continues longer than where ground of a better quality is in a different situation."

Another factor in the high value of the agricultural land near Edinburgh is the increasing demand for land for other than agricultural purposes, especially for building or for the provision of pleasure grounds and open spaces.

But since 1879, when Mr. Richardson's map was published, the conditions have very much altered, and there has been a great decline in the value of the land throughout the district. The decrease has not been at all uniform, nor is it easy to find any geographical explanation of its distribution. The writer is indebted to Mr. Lynch, the Assessor for the County of Midlothian, for the details of the annual rental of the agricultural land in each parish in 1881 and 1901. In the former year the total value of the land in the county amounted to £264,002: twenty years later this had fallen to £193,467, a decrease of 26·7 per cent. As will be seen from the following table, the percentage of decrease in each parish varies from 13·1 in the small parish of Newton to nearly 44 in the case of Stow, which, however, does not fall within the Edinburgh district, and it is rather remarkable that the largest decrease has taken

place in the parishes of the Midlothian basin, although in some cases there has been a compensating development of the mineral resources.

TABLE showing the Percentage of Decrease in the Annual Rental of the Agricultural Land in each Parish of Midlothian from 1881 to 1901.

Parish.	Rental in 1881.	Decrease per cent. in 1901.	Parish.	Rental in 1881.	Decrease per cent. in 1901.
Colinton,	£10,311	27·7	Dalkeith,	£5,893	34·5
Corstorphine,	13,405	17·6	Glencorse,	4,956	33·2
Cramond,	15,177	22·6	Inveresk,	14,082	31·1
Liberton,	22,641	20·2	Lasswade,	17,000	26·0
Newton,	8,168	13·1	Newbattle,	8,841	36·3
Currie,	16,710	21·2	Penicuik,	10,090	28·2
Kirkliston,	5,463	17·4	Borthwick,	10,492	31·8
Kirknewton,	9,270	18·1	Cranston,	7,742	34·0
Midcalder,	9,867	29·3	Crichton,	6,795	29·2
Ratho,	12,690	15·3	(Fala,	1,579	30·0)
West Calder,	10,320	24·4	(Heriot,	6,089	22·5)
Carrington,	4,246	25·6	(Stow,	18,936	43.9)
Cockpen,	5,672	33·9	Temple,	7,559	38·8

(To be continued.)

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

AT a Meeting of Council held on Tuesday, 7th November, the following ladies and gentlemen were elected Ordinary Members of the Society :—

Mrs. Cattanach.
Miss Eliza Bell Grant.
Miss Mary Wilson Porter.
Mrs. E. S. Gloag.
Mrs. Ferrier Mitchell.
Miss Christina Duncanson.
Miss Mary Duncanson.
Miss Melvin.
Mrs. Isabella Green.
Miss Helen Drummond.
Alex. Shearer.
John Corrie.
Ernest Alfred Parkinson, B.A.
J. O. Angus.
August Schnepel.
J. D. Falconer, M.A., D.Sc.
James Nivison M.A.
William A. Bryden.
Donald Patton.
James Meiklejohn, M.A.
James H. Hyde.
J. W. E. Steedman, S.S.C.
James Henry Anderson, M.Inst.C.E.
Thomas Elliot.
Alexander Wingate Miller.
Walter Lampson.
H. D. Hardie.
Alex. Matheson.
Wm. Miller, M.A., D.Sc., Ph.D., B.Sc.
J. Graham Fairley.
Gideon J. Gibson.

The following were elected Teacher Associate Members :—

Miss E. R. Barty.
Mrs. Rachel Annie Ames.
Miss G. C. Matthew.
Miss C. M. Hawick, M.A., B.Sc.
Miss Kate Ferguson.
Miss Jane P. Morrison.
Miss Snell.
Miss Eliza H. Chisholm.
Miss Helen Ligertwood.
Miss Elizabeth S. Purdie.
Miss Ann Wishart.
Miss Jessie D. Stewart, M.A.
Miss Jane C. Blackie.
Miss M. Burmeister.
Miss Harriett A. Hartley, M.A.
Miss E. H. Millar.
Miss Elizabeth Tough.
Miss Marion R. Law.
Miss Lizzie C. Deas.
Miss Mary Gardiner.
Miss Annie M. Youngson.
Chas. Andrew Cotton, M.Sc.
Robert Wilkie.
John Dall, M.A.
Chas. Matheson, M.A.
Samuel Gray, M.A.
Sam. R. Skilling, M.A.
David Coutts, M.A.
David Taylor.
James H. Mitchell, M.A.

Medal Awards.

The Council unanimously agreed to award the Society's Gold Medal to Mr. J. Y. Buchanan, F.R.S., for his distinguished services to geography, especially in connection with oceanographical research. It was also agreed not to award the Livingstone Gold Medal this year.

The Society's Silver Medal offered for competition in the geography class, Edinburgh University, was awarded to Mr. Thomas M. Steven.

Diploma of Fellowship.

The Ordinary Diploma of Fellowship was conferred on Robert Blyth of Balvonie, Skelmorlie, a Member of Council of this Society, and on Adam Patterson Gray, M.A.

Livingstone Centenary.

Captain Livingstone Bruce was nominated as the Society's representative to act on a committee appointed to make preparations for the worthy celebration of the centenary of the birth of David Livingstone, March 1913.

Lectures in December.

Major Leonard Darwin (late R.E. ; vice-president and late president R. G. S.), will address the Society in Aberdeen, Edinburgh, and Glasgow, on the 6th, 7th, and 8th December respectively. The subject of the address will be "The Personal Characteristics of Great Explorers."

On 4th December Mr. Gerrard de Hochpied Larpent, B.A. (Cantab.), will lecture to the Dundee Centre on "The Progress and Development of Rhodesia."

The Christmas lecture will be delivered by Mr. W. H. Shrubsole, F.G.S., on the following dates :—Aberdeen, 19th ; Dundee, 20th ; Edinburgh, 21st ; and Glasgow, 22nd December. "Among the Carpathians" will be the title of the lecture.

The Annual Business Meeting.

Presentation of Professor Geikie's Portrait.

The Annual Business Meeting was held in the Society's Rooms on Tuesday the 7th November, when the Earl of Stair presided over a large gathering of members. The first business was the unveiling of the portrait of Professor Geikie, subscribed for by the members of the Society, and the presentation of a replica of the portrait to Mrs. Geikie. Dr. J. Horne, in making the presentation, said :—

"I have been asked to make some observations on the scientific career of Professor Geikie, and on the services which he has rendered to this Society. It is no exaggeration to assert that in the province of glacial geology, to which he has devoted unremitting labour, he is an acknowledged master. When the first edition of his work on *The Great Ice Age* appeared in 1874, geologists frankly admitted that it gave the first systematic account of the deposits of that remarkable epoch, with special reference to climatic change. Taking Scotland, with which he was familiar, as a type region, he showed the mode of investigating and the principles of interpreting glacial phenomena. He furnished a lucid description of the sequence of events in glacial and post-glacial time. Then he proceeded to indicate the succession of climatic changes in every glaciated region that had been carefully studied by geologists. He endeavoured to show that the glacial epoch was not one continuous age of ice, but consisted rather of a series of alternate cold and warm periods for which he adduced clear palæontological evidence. He advocated the view that the palæolithic gravels of England were not post-glacial, but must be relegated to inter-glacial or pre-glacial time. He also appeared as a strenuous supporter of Ramsay's ideas of the erosive power of ice and of the glacial origin of rock basins.

"With the appearance of this work, Professor Geikie became one of the foremost leaders in glacial geology. The volume filled a gap in geological literature. Its success was so remarkable that a second edition was issued within three years, in which he adhered to his main positions, and modified others. There can be little doubt that a work so comprehensive in its scope, and so controversial in some of its positions, gave a great stimulus to the study of glacial phenomena all over the globe. The views put forth by Professor Geikie might or might not be accepted. They might be contentious, but they furnished a clear basis on which to work, and with which investigators had to reckon. Ever since that time this branch of inquiry has been pursued with great enthusiasm, and a voluminous literature bearing on it has steadily accumulated.

"In 1881 a supplementary volume appeared on *Prehistoric Europe*, in which, among other subjects, he dealt with the cave deposits and river deposits of the glacial period, and the bearing of this evidence on the question of the antiquity of man.

"With this record of original research, and with his ripe experience as a field geologist, obtained in the Geological Survey, there was general satisfaction when, in 1881, he was appointed to succeed his brother, Sir

Archibald Geikie, as Murchison Professor of Geology in the University of Edinburgh. The claims of the University on his time did not diminish his zeal for his own special line of research. Thus we find that in 1894 he produced a third edition of his *Great Ice Age*, completely revised, largely rewritten, and showing an intimate acquaintance with the literature that had appeared during the interval of seventeen years. No stronger proof need be cited of his prominence as a leader in this line of research than the fact that the great work on *Die Alpen im Eiszeitalter*, by Penck and Brückner, is dedicated to him.

"His clear grasp of geological structure has borne fruit in various ways. He has enforced the close connection that exists between the studies of the physical geographer and the geologist. Among his scientific addresses I might refer to one, perhaps the ablest of them all, which was delivered to the Geographical Section of the British Association in 1892 on 'The Geographical Development of Coastlines,' in which he shows the relation between the trend of coastlines and crustal movements. But even within the last few years his keen interest in the branch of research relating to the evolution of mountain form shows no abatement. Geologists and geographers are familiar with the revolution that has taken place in the interpretation of the structure of the Alps, led by Suess, Bertrand, Schardt, Lugeon, and Steinmann. Not content with accepting the novel views without examination, he visited typical sections on the ground to see the evidence for himself. His paper on 'The Architecture and Origin of the Alps,' published in the August number of the *Scottish Geographical Magazine*, is remarkable for its broad grasp and lucid exposition, considering the extremely complicated nature of the evidence.

"From the remarks I have made it will be self-evident that it was of the highest moment to this Society to secure his co-operation at the outset. As you well know, he has served continuously on the Council since its foundation, he has acted as Honorary Editor of the magazine, he has been President for six years. In conjunction with the Council he has striven to raise the standard of geographical education in the country. In short, he has closely identified himself with the work of the Society in all its branches, and, with Dr. Bartholomew and others, has laboured strenuously to secure its success.

"On his retirement from the Presidentship, many of the Fellows felt that some adequate recognition of such devoted service should be made. And when the presentation of a portrait was suggested, the proposal met with a cordial response."

The Earl of Stair then unveiled the portrait, and presented the replica to Mrs. Geikie. A reproduction of the portrait, which is by Mr. E. A. Walton, R.S.A., forms the frontispiece of the present issue.

Professor Geikie, in reply, said he was deeply sensible of the great honour that had been done him by his friends and colleagues. No one could exaggerate the interest he had always felt in the Society. He worked for it harder than he had thought of working for any other Society with which he had been connected. He was one of its founders, and was bound, therefore, to do all he could for its advancement. He

remembered when he first came to Edinburgh feeling rather depressed with the stagnation of geographical education in this country, and revolving in his mind various schemes as to how he could stimulate and awaken some interest in the subject. They could well understand how some five-and-twenty years ago, when his friend and former pupil, Mr. Bartholomew, came to him with the suggestion for the foundation of a Scottish Geographical Society, he leapt at once at the idea. It was to Mr. Bartholomew, therefore, that they owed their existence as an institution. When he thought of the many friends who had come and gone in connection with the Society, he was filled, naturally enough, with deep feeling. Many of those who joined with them in setting the good ship afloat had passed away. Many still remained active members of the Society. He wished to thank not only the old members, but the young ones also, for the confidence they reposed in him during his term of office as President; and to say how greatly he felt the kindly appreciation of the subscribers, who had been so good as to present a replica of the portrait to his wife. She and their children would value it highly; and she desired him to express to them her sincere and heartfelt thanks for their generous kindness.

The Chairman said he thought they might congratulate themselves on this excellent addition to their gallery, and Mr. Walton on the excellence of the work he had done.

The Chairman then read a letter received from the Earl of Scarborough in reference to the proposed memorial to Mungo Park and Richard Lander, which is to be erected on the banks of the Niger. A Committee has been formed to promote this object, and the Earl of Stair's name has been added as representing the Royal Scottish Geographical Society. A leaflet giving details of the scheme is lying at the Society's Rooms.

The Secretary then read the Annual Report (see pp. 668-670), and Mr. James Currie, M.A., F.R.S.E., Hon. Treasurer, made a short statement in regard to the finances of the Society, which are in a very flourishing condition. The Report was unanimously adopted.

The list of Council and Office-bearers recommended by the Council for election was submitted to the Meeting, and on the motion of Mr. Muir, seconded by Mr. Rush, the Council and Office-bearers as recommended were unanimously elected. George Smith, C.I.E., LL.D., a member of Council, was elected a Vice-President. Of the fourteen members of Council retiring by rotation among the Edinburgh members of Council the following were re-elected:—Major-General P. C. Dalmahoy; J. Edward Graham, K.C., B.A.; James Macdonald, W.S.; Colonel Sir Philip Durham Trotter; George Smith, M.A.; D. F. Lowe, M.A., LL.D.; Colonel T. Cadell, V.C., C.B.; W. B. Blaikie, F.R.S.E.; Colonel Wardlaw Ramsay. Sir Donald Macalister, K.C.B., M.D., M.A., D.C.L., B.Sc., F.R.C.P., F.R.G.S., was re-elected for Glasgow.

The following members of the Society were elected to fill the vacancies existing:—Edinburgh—John Mathieson, F.R.S.G.S.; Glasgow—Robert Blyth, C.A., F.F.A., and Ebenezer Duncan, M.D., C.M., F.F.P.S.G.

The Chairmen of the Glasgow, Dundee, and Aberdeen Centres were re-elected :—Glasgow—Paul Rottenburg, LL.D. ; Dundee—R. B. Don, J.P. ; Aberdeen—William Smith.

GEOGRAPHICAL NOTES.

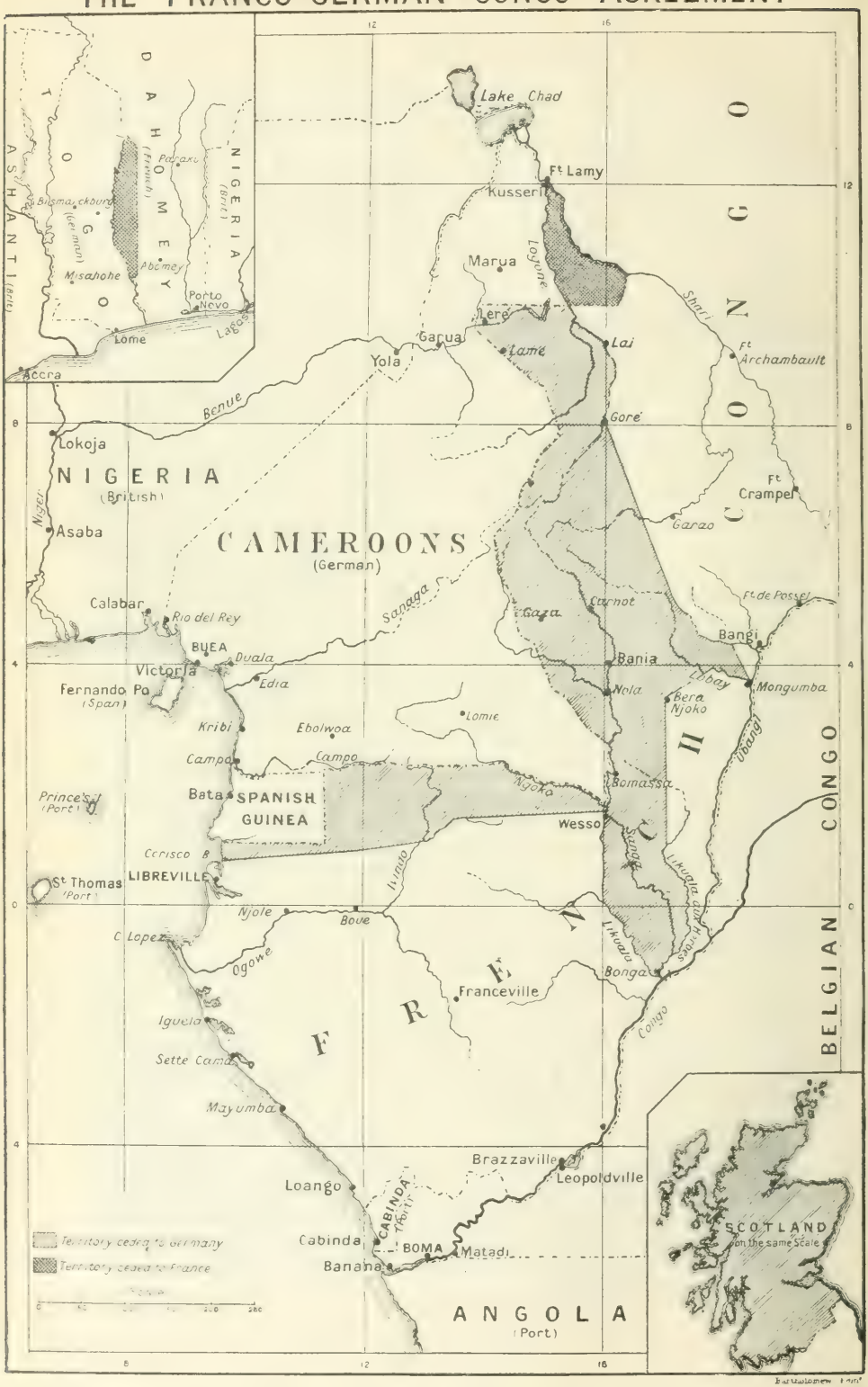
Africa.

The Franco-German Congo Agreement (with Map).—The accompanying map shows the territorial changes in the French Congo and the German Cameroons, as defined in the recent Treaty between these two powers. In return for her recognition of a French Protectorate in Morocco, Germany receives certain territories which modify the present frontier of the Cameroons as follows. The new frontier runs from Massoti, a point considerably to the north of the Mondah estuary, which commands Libreville, in almost a straight line eastward to Wesso. Wesso remains French, and from it the frontier turns sharply to the south and proceeds to the junction of the Sanga and Congo rivers. Thence it turns north as far as Bera Njoko, and then follows the Lobay eastward to the Ubangi river at Mongumba. From Mongumba the line runs straight north to the eighth parallel, and then follows the Logone to the junction of the Shari and Lake Chad. By the cession of the piece of territory known as the Duck's Beak to France the north-eastern frontier of the Cameroons is thrown back to the Logone, so that the whole of the right bank of that river, up to the junction with the Shari at Fort Lamy, becomes French.

The total extent of the territory ceded to Germany is estimated at from 180,000 to 250,000 square kilometres. The wide margin of this estimate indicates that the work of delimitation will not be very easy. The black population is estimated at from 1,000,000 to 1,200,000. The revenue is about £48,000, derived from the capitation tax, while the companies which hold concessions pay dues to the amount of from £24,000 to £32,000 a year. The total trade in imports and exports is about £400,000 to £480,000.

The total extent of the German cession to France is about 14,000 square kilometres. A very important provision is that which gives France free transit along the Mao Kebbi river from her new acquisition through German territory to the Benue. It is estimated that the cost of carriage by water to the upper portions of the French Congo and Lake Chad territory will be immensely reduced by the opening up of this new route. Formerly goods, stores, and ammunition, after having been convoyed up the Congo and the Ubangi, had to be carried across country for a great distance by native porters. No duties can be imposed on goods passing through the new German territory along the rivers Benue and Mao Kebbi. France will further obtain *enclaves* of land to the extent of 50 hectares each on the Benue and the Mao Kebbi, and also in the direction of the Logone river, which will enable her to establish revictualling posts and stores.

THE FRANCO-GERMAN CONGO AGREEMENT



Polar.

The German Antarctic Expedition.—Mr. R. C. Mossman informs us that the Antarctic research ship *Deutschland* left Buenos Aires on October 4 after a stay of four weeks. During this time the constants of the magnetic instruments were compared with those of the central magnetic observatory at Pilar, and the barometer with the standard of the Argentine Meteorological Office. Arrangements have been made for the transmission twice daily of a time signal by wireless telegraphy from the meteorological and magnetical station at New Year's Island (lat. 54° 09′ S., long. 64 08′ W.) Along with the time signal will be sent the barometric pressure, temperature, and wind direction and force at 8 A.M. and 8 P.M. Cordoba mean time. The power of the Marconi installation at New Year's Island is to be largely increased, but while the *Deutschland* will be able to receive, it will not be able to send messages beyond a radius of 620 miles.

On leaving Buenos Aires the expedition was to engage in oceanographical research in the South Atlantic, paying particular attention to the region in the vicinity of lat. 49° S., long. 30° W., where shallow water is believed to exist. After this the *Deutschland* was to investigate the South Sandwich Group, taking a line of soundings from Southern Thule to South Georgia, the main base of the expedition. It was expected that this preliminary cruise would last till November 10, when the vessel was expected to arrive at Grytviken, the headquarters of the Argentine Fishing Company on the north side of South Georgia (lat. 54° 14′ S., long. 36° 33′ S.) Here a large quantity of coal, stores, and the thirteen ponies will be embarked, the dogs being already on board. It was Lieut. Filchner's intention to leave finally for the South on December 1, going due south in the meridian of 36° W., and to establish a southern base in as high a latitude as possible to the south-west of Coats Land. Here the wooden house will be set up, and if a good harbour can be found the ship will also winter. The expedition is very well equipped especially in the departments of oceanography, meteorology, and magnetism. Dredging in great depths does not, however, form part of the programme. The three motor sledges have proved unsatisfactory, exhibiting grave defects during some trials carried out in Buenos Aires, and have been sent back to the makers.

Amundsen's Antarctic Expedition.—Mr. R. C. Mossman also informs us that the *Fram* left Buenos Aires on October 5 for the Bay of Whales, where she is due about the end of December. The vessel will proceed under sail by the long ocean route to the South of Africa and Tasmania, as the short route round Cape Horn in the teeth of the westerlies is not suited to a vessel of low steam power, such as the *Fram*. The members of the expedition while in Buenos Aires showed great reticence with regard to Amundsen's southern journey, but it is understood that he was to leave for the South not later than the middle of September, and that he hoped to reach the plateau by another way than that of the Beardmore glacier. The report that he would attempt

a trans-Antarctic journey is officially denied, but if sufficient food can be taken up the glacier to the plateau this attempt will probably be made. In this case the most likely point of emergence would be Alexander Land, a region which Amundsen has previously visited on board the *Belgica*.

General.

Eighteenth International Congress of Americanists.—It is announced that this Congress will be held in London, under the Presidentship of Sir Clements R. Markham, from May 27 to June 1, 1912. Application for membership should be sent to the Secretary, Mr. F. C. A. Sarg, Royal Anthropological Institute, 50 Great Russell Street, London, W.C.

The Symons Medal of the Royal Meteorological Society.—We are informed that the Council of the Royal Meteorological Society have awarded the Symons Gold Medal to Professor Cleveland Abbe of the United States Weather Bureau, in recognition of the valuable work which he has done in connection with meteorological science. The Medal will be presented at the Annual Meeting of the Society on January 17th, 1912.

EDUCATIONAL.

Sale of Ordnance Maps to Schools.—We note from the *Report* of the Progress of the Ordnance Survey to the 31st March 1911, that the use of these maps in schools appears to be diminishing rather than increasing. Thus the number supplied at the reduced rates in 1910-11 was 50,720 as against 55,012 for 1909-10.

A New Practical Geography.—We have received from Messrs. Geo. Philip and Son a new *Class-book of Practical Geography*, by Messrs. Young and Fairgrieve, which may be taken as an indication of the increased interest which is being taken in the practical side of the subject in schools. The book devotes a considerable amount of space to Maps and Map-making, and gives some very interesting exercises and problems in map-reading, section-drawing and similar matters. These are subjects which teachers whose training was of the older type find difficult to teach, and the numerous examples and diagrams given here should prove useful to teachers and scholars alike.

A German Geographical Journal for Teachers.—We have been asked to draw attention to the fact that from October last the periodical called *Zeitschrift für Schulgeographie*, formerly published by Hölder in Vienna has been taken over by the firm of Justus Perthes in Gotha, and amalgamated with the *Geographischen Anzeiger*. The

Zeitschrift was founded by Professor Seibert in 1879 and edited by him for twenty years, and afterwards successively by Professor Anton Becker and Professor Gustav Rusch. The *Geographischer Anzeiger* is now in its twelfth year, and is edited by Dr. Hermann Haack and Professor Heinrich Fischer. Since its amalgamation with the *Zeitschrift* it is the only periodical which deals exclusively with the interests of geographical teaching in German schools of all kinds and grades. It appears in monthly parts at a price of 6 marks per annum.

NEW BOOKS

ASIA.

The Kacháris. By the late Rev. Sidney Endle. London: Macmillan and Co. *Price 8s. 6d. net.*

This little book, which is published by order of the Government of Eastern Bengal and Assam, is by way of being a memorial of the author, who was for forty years missionary of the S. P. G. in the Assam Valley. For the greater part of that time Mr. Endle's station was in the important tea-planting district of Darrang, where he acted as chaplain to the European community, besides being in charge of the Kachári Mission. We learn from an appreciative introduction by Mr. J. D. Anderson, I.C.S., that Mr. Endle was a man of a singularly winning nature who had made himself beloved and respected, not only by the Europeans in his district, but also by the Kachári natives, to whom he was devoted, and who, in their turn, regarded him as a friend. The notes of which the book is made up are mainly ethnological, dealing with the origin, distribution, and traditions of the Kachári (a branch of the Bodo races, Mongolian, rather than Indian, in type, who inhabit the country to the south of the Bhutan hills lying between 90° and 94° E. longitude, and 23° to 27° N. latitude), and also with their social and domestic life, their laws, customs, religion and folk-lore. The Kachári are on the whole a happy and healthy race, and Mr. Endle quotes the remark of a planter friend to the effect that of all the various races employed on his extensive tea estates "they were the only people who might frequently be heard whistling as they went to and from their daily toil." In India, this is a fact of some significance.

An attractive picture is given of the social life of these people; the men working in their rice-fields, while the women, in addition to their domestic duties, tend the silk-worms, wind the cocoons, and weave from the thread a durable kind of silk cloth called *eri*. The author says, of this special woman's work of silk-weaving:—

"Indeed, a Kachári woman working placidly and contentedly at the *eri* loom, singing quietly to herself in sheer happiness of heart, offers, perhaps, one of the most complete illustrations of the Pax Britannica to be found in the wide realm of India; especially when it is borne in mind that, less than seventy years ago, these Kachári Duars were subject to the Bhutan Rajas, who seem to have harried and plundered the people in the most cruel and lawless way."

The specimens of Kachári folk-tales which form the concluding part of the volume are taken from a collection made by Mr. J. D. Anderson, I.C.S., who also writes the introduction. The stories, which are printed both in the original and in translation, in order that they may be of use to linguistic students, are

quaint and interesting in their resemblance to the folk-tales of Europe collected by the brothers Grimm and others. In the tale of "The Monkey and the Hare," the latter animal figures as a counterpart of "Brer Rabbit," and manages to come off best at the expense of the other.

We can recommend the book to all who are interested in the Indian peoples.

The Surgeon's Log. Being Impressions of the Far East. By J. Johnston Abraham. With forty-four Illustrations. London: Chapman and Hall, Limited, 1911. *Price 7s. 6d. net.*

A voyage in a cargo-boat from Liverpool to Japan by the Suez Canal, Pinang, and Singapore, with glimpses of Macassar and Java on the way home does not seem to promise anything new. But Mr. Abraham writes with such freshness and enthusiasm that his book reads better than most novels, and one is only sorry that there is not more of it. Here and there one meets some interesting facts introduced in a most casual and natural manner, but the general treatment is that of giving the impressions of a singularly observant person. His chapters on Japan remind one of Loti in their delicacy of suggestion, but Loti's artificiality is totally absent. The author is by nationality humorous, but the reader does not require to be an Irishmen in order to appreciate the quiet fun which peeps out irresistibly every now and then. The book is well illustrated, and we can cordially recommend it to all who can enjoy a well-told tale.

Le Laos. Par Lucien de Reinach, Capitaine de cavalerie. Edition posthume, revue et mise à jour par P. Charles Dupontès. Paris: E. Guilmoto, 1911. *Price 7 fr. 50.*

This book comes to us with the *imprimatur* of the distinguished French proconsul and statesman M. Paul Doumer, who has special knowledge of both the writer and his subject. In a generous and appreciative introduction M. Doumer tells us that Capt. Lucien de Reinach spent the best part of his life in Laos, where he had known him fifteen years ago. As Governor-General of Indo-China he had seen Capt. de Reinach's work and was able to vouch for his zeal, devotion, and ability, his loyalty to the government, and kindly attitude to the people. His untimely death, the result of malaria caught in the discharge of his duty, deprived France and Indo-China of a most promising and talented officer. This work is the result of his keen desire to understand the past history and present condition of those whom he was sent to govern, and to make his exceptional knowledge available for those who were to follow him. A book coming to us under these conditions is necessarily interesting and instructive; and yet a careful perusal of it gives us the impression, that with all his zeal and enthusiasm Capt. de Reinach was dissatisfied with his surroundings and almost hopeless of his task. For this there were two outstanding reasons, the one the paucity and character of the people of Laos, and the other, the apathy or passivity of the French government. The population of the whole country is estimated at about 700,000; less than half the population of an ordinary Indian district. For this want of population Capt. de Reinach gives two good reasons, viz., the poverty of the soil and political events, by which the spirit and energy of the inhabitants have been, for the time at least, badly impaired, if not destroyed. The French government can, and of course will, now ensure peace and all the prosperity which peace brings in its train to its Indo-Chinese subjects. But even if by vigorous administration and lavish expenditure on irrigation, etc., the area available for cultivation were largely extended, and if by a prolonged period of peace and prosperity the popula-

tion was substantially increased and heartened, their innate laziness, apathy and dislike of work gives little hope of permanent improvement. "Les populations de Laos," writes Capt. de Reinach, "étaient, à notre arrivée, découragées ; elles semblaient incapables de prendre une initiative quelconque pour sortir de leur longue torpeur et recouvrer, avec l'indépendance, leur ancien état de prospérité. Depuis un siècle surtout, cet infortuné Laos a été la proie de voisins rapaces qui l'ont dépouillé. Il n'est pas étonnant qu' à la suite de ces événements les habitants aient conservé un triste souvenir du passé, qu'ils soient incertains du présent et qu'ils redoutent l' avenir." Capt. de Reinach somewhat sorrowfully is constrained to admit that little is to be expected from the indigenous population, and suggests that the best hope for Laos lies in immigration from Annam or China. When we turn to the book for indications of vigorous administration or lavish expenditure in development on the part of the government since the annexation, it appears that both are conspicuous by their absence. Again we quote Capt. de Reinach : "Depuis dix-huit ans, le Laos est devenu possession française mais les conditions intérieures du commerce et des échanges n' y ont pas varié. Une seule modification a été le résultat de notre occupation, la création d'une ligne de transports à vapeur sur le Méhong" : but the value of the transport service has been practically destroyed by heavy customs duties. The primary want in so undeveloped a country is of course good roads, and on this point Capt. de Reinach is quite distinct. "Il n' existe guère au Laos que des sentiers, et ceux-ci suffisent pour assurer les communications par voie de terre." Under such circumstances it is not surprising that the condition of Laos is far from satisfactory ; and even the sanguine loyalty and enthusiasm of Capt. de Reinach cannot create a rosy picture of the present and future prospects of the people.

This volume is a valuable handbook of general information regarding the past history and present condition of Laos drawn up by a zealous and able officer, who was determined to make the best of everything and who was wise enough and courageous enough to tell the truth. As such, it will be of much value to the French Colonial Office, and to every one who is interested in French Indo-China.

GENERAL.

Off the Main Track. By Stanley Portal Hyatt, Author of *The Diary of a Soldier of Fortune.* Illustrated. London : T. Werner Laurie. Colonial Edition, 1911. *Price* 12*s.* 6*d. net.*

"He"—the Little Englander—"hates big things, because they make himself look so very small. . . . He has been born without a sense of proportion, and as, in most cases, he has not been to a public school, he has never had anything of the kind kicked into him. . . . You find no Little Englanders on the frontier. The atmosphere does not suit them. . . . The most serious risk most of them ever run is that of prosecution over a municipal contract.'

"I believe I like the Imperialist, who announces himself loudly as such, as little as I like the Little Englander. The former is usually so blatant, and so very, very silly. . . . He is not interested in little places like Singapore, or Hong Kong, or Aden, and he would laugh in a superior manner if you told him that they were of more value to us than all the self-governing colonies. How can that be ? he asks. They are mere dots on the map, and the other colonies are great red blotches."

These extracts give a fair idea of the style of Mr. Hyatt's book. As he himself says, he is fond of tilting at windmills. It is impossible to be cross with him. He gives one the impression of being a great overgrown schoolboy who has seen something of the world, finds it not to his liking in places, and is furiously, blindly angry with he knows not what. It is really very sad. If Mr.

Hyatt wishes his books to be read by the general public as well as by the patient and conscientious reviewer, he should endeavour to acquire some method in his writing. There is a good deal of wheat in his book, but it requires vigorous winnowing to separate it from the chaff. The lack of system extends to the illustrations, which are seldom relevant to the text.

BOOKS RECEIVED.

The Canadian Rockies: New and Old Trails. By A. P. Coleman, Ph.D., F.R.S. With 3 Maps and 41 Illustrations. Demy 8vo. Pp. 383. *Price* 12*s.* 6*d. net.* London: T. Fisher Unwin, 1911.

Nigeria: Its Peoples and its Problems. By E. D. Morel. With Illustrations and Map. Sm. Ry. 8vo. Pp. xviii + 265. *Price* 10*s.* 6*d. net.* London: Smith, Elder and Co., 1911.

Land and Peoples of the Kasai: Being a Narrative of a Two Years' Journey among the Cannibals of the Equatorial Forest and other Savage Tribes of the South-Western Congo. By M. W. Hilton-Simpson, F.R.G.S., F.Z.S., F.R.A.I. With Numerous Illustrations and 8 Full-page Colour Plates and a Map. Demy 8vo. Pp. xx + 356. *Price* 16*s. net.* London: Constable and Co., Ltd., 1911.

On Horseback through Nigeria, or Life and Travel in the Central Sudan. By J. D. Falconer, D.Sc. With a Map and 32 Illustrations. Demy 8vo. Pp. 312. *Price* 12*s.* 6*d. net.* London: T. Fisher Unwin, 1911.

Fifteen Thousand Miles by Stage: A Woman's Unique Experience during Thirty Years of Path Finding and Pioneering from the Missouri to the Pacific, and from Alaska to Mexico. By Carrie Adell Strahorn. With 350 Illus. Demy 8vo. Pp. xxviii + 673. *Price* 16*s.* London: G. P. Putnam's Sons, 1911.

A Naturalist on Desert Islands. By Percy R. Lowe, B.A., M.B. (Cantab.). With 32 Plates and 3 Maps. Demy 8vo. Pp. xiv + 300. *Price* 7*s.* 6*d. net.* London: Witherby and Co., 1911.

Through Trackless Labrador. By H. Hesketh Prichard, F.R.G.S. With a Chapter on Fishing by G. M. Gathorne-Hardy, F.R.G.S. Illustrated with a Frontispiece by Lady Helen Graham, a Map of the Route, and from Photographs. Imp. 8vo. Pp. xv + 254. *Price* 15*s. net.* London: Wm. Heinemann, 1911.

Things seen in Northern India. By T. L. Pennell, M.D., B.Sc., F.R.C.S. With 50 Illustrations. 16 mo. Pp. 252. *Price* 2*s. net.* London: Seeley, Service and Co., Ltd., 1911.

The Beauty, History, Romance, and Mystery of the Canadian Lake District. By Wilfred Campbell. Cr. 8vo. Pp. 191. *Price* 3*s.* 6*d. net.* London: Hodder and Stoughton, 1911.

The Making of a Great Canadian Railway: The Story of the Search for and Discovery of the Route, and the Construction of the Nearly Completed Grand Trunk Pacific Railway from the Atlantic to the Pacific, with some account of the Hardships and Stirring Adventures of its Constructors in Unexplored Country. By Frederick A. Talbot. With 43 Illustrations and a Map. Demy 8vo. Pp. 349. *Price* 16*s. net.* London: Seeley, Service and Co., Ltd., 1911.

In Northern Mists: Arctic Exploration in Early Times. By Fridtjof Nansen, G.C.V.O., D.Sc., Ph.D. Illustrated. 2 vols. Ry. 8vo. Pp. vol. i. xi + 384, vol. ii. 416. *Price* 30*s. net.* London: Wm. Heinemann, 1911.

The Traveller's Handbook for Spain. By Albert F. Calvert. With Maps, 24 Plans of Towns, and 83 Illustrations. Fcap. 8vo. London: Thos. Cook and Sons, 1911. *Price* 7*s.* 6*d. net.*

Der Panamakanal. Die Bedeutung des Kanalbaues: seine Technik und Wirtschaft. Von Dipl. Ing. MAX. D. FIEGEL. Mit 16 Abbildungen und einer Übersichtskarte. Demy 8vo. Pp. 183. *Preis M.* 14. Berlin: Dietrich Reimer, 1911.

The Emir of Bokhara and his Country: Journeys and Studies in Bokhara (with a Chapter on my Voyage on the Amu Darya to Khiva). By Prof. O. OLUFSEN. With a Map of Bokhara and Numerous Illustrations. Ry. 8vo. Pp. ix+599. *Price* 21*s. net.* London: Wm. Heinemann, 1911.

The Civilisation of China (Home University Library). By HERBERT A. GILES, M.A., LL.D. 12 mo. Pp. 256. *Price* 1*s. net.* London: Williams and Norgate, 1911.

L'Afrique Équatoriale Française. MAURICE RONDET-SAINT. Préface de M. MARCEL SAINT-GERMAIN. Avec une Carte. Deuxieme Édition. Cr. 8vo. Pp. iv+312. *Prix* 3 *fr.* 50. Paris: Plon-Nourrit et Cie, 1911.

The Vegetation of Caithness considered in Relation to the Geology. By C. B. COMPTON, M.B., C.M. Med. 8vo. Pp. 132. Edinburgh: Committee for the Survey and Study of British Vegetation, 1911.

The Climate of the Continent of Africa. By ALEXANDER KNOX, B.A. (Cantab.), F.R.G.S. Med. 8vo. Pp. xiv+552. *Price* 21*s. net.* Cambridge: University Press, 1911.

Letters from Norway. By Sir WALTER F. MIÉVILLE, K.C.M.G., etc. Cr. 8vo. Pp. 200. *Price* 2*s.* 6*d. net.* Brighton: Combridge, 1911.

The Story of Avignon. By THOMAS OKEY. Illustrated by PERCY WALHAM. Cr. 8vo. Pp. xiv+407. *Price* 4*s.* 6*d. net.* London: J. M. Dent and Sons, Ltd., 1911.

Ranching, Sport, and Travel. By THOMAS CARSON, F.R.G.S. With 16 Illustrations. Demy 8vo. Pp. 319. *Price* 10*s.* 6*d. net.* London: T. Fisher Unwin, 1911.

The Official Year Book of New South Wales, 1909-10. By JOHN B. TRIVETT, F.R.G.S., F.S.S. Sydney, 1911.

Levelling of Precision in India (1858-1909). By Colonel S. G. BURRARD, R.E., F.R.S. Account of the Operations of the Great Trigonometrical Survey of India. Vol. 19. Dehra Dun, 1910.

Diplomatic and Consular Reports.—Trade and Agriculture of Poland and Grodno, 1910 (4799); Trade and Commerce of Costa Rica, 1910 (4800); Foreign Commerce of Russia and Trade of the Consular District of St. Petersburg, 1910 (4801); Trade of Damascus, 1910 (4802); Trade, Commerce, etc., of Santa Catharina, 1910 (4803); Trade, etc., of the Spanish Possessions in the Gulf of Guinea, 1910 (4804); French Budget for 1911 (4806); Trade and Navigation of the Port of Dairen, 1910 (4789); Trade and Commerce of the Consular District of Riga, 1910 (4805); Trade and Commerce of Belgium, 1910-11 (4807); Trade and Commerce of Algeria, 1910 (4808).

Colonial Reports (Annual).—Report for Hong Kong, 1910 (691); Report for Nyasaland, 1910-11 (692); Report for Seychelles, 1910 (693); Report for Sierra Leone, 1910 (694).

Colonial Reports (Miscellaneous).—Northern Nigeria, Report on the Results of the Mineral Survey, 1907-8-1908-9 (79); Nyasaland, Report on the Results of the Mineral Survey, 1908-9 (80); Southern Nigeria, Report on the Results of the Mineral Survey, 1908-9 (81).

Publishers forwarding books for review will greatly oblige by marking the price *in clear figures, especially in the case of foreign books.*

ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

REPORT OF COUNCIL.

Twenty-Seventh Session, 1910-1911.

The Council has the honour to submit the following Report :—

Ordinary Membership.

The changes which occurred during the Session in the number of members were as follows :—

Number on 1st November 1910,		2127
New Members added,		62
		2189
Deduct by Death,	37	
„ Resignation,	158	
		195
Number of ordinary members remaining on roll on 30th September 1911,		1994

Of this number, 1047 are on the Edinburgh list, 498 are on the Glasgow list, 163 and 132 are on the Dundee and Aberdeen lists respectively. In addition to those on the lists named, 41 members reside abroad, and 102 reside in England. The number of life members in the total given above is 234.

Teacher Associate Members.

Number on 1st November 1910,		155
New Members added,		34
		189
Deduct by Death,	1	
„ Resignation,	34	
		35
Number of Teacher Associate members remaining on roll on 30th September 1911,		154

Meetings of the Society.

The Society's Anniversary Meeting was addressed by Sir John Murray, K.C.B., D.Sc., Ph.D., LL.D., F.R.S. Thirty-two ordinary meetings were held, nine in Edinburgh, ten in Glasgow, seven in Dundee, and six in Aberdeen. These meetings were addressed by Sir Andrew H. L. Fraser, LL.D., K.C.S.I.; Mrs. Gabrielle Vassal; Dr. Jean B. Charcot; Dr. H. Karl W. Kumm; Dr. H. A. Lorentz; Dr. Hamilton Rice; Mr. Howard Reed; Rev. James Webster; Captain H. G. Lyons, D.Sc., F.R.S.; and Mr. J. S. Dennis.

Medals Awarded.

The Livingstone Gold Medal of the Society for 1910 was awarded to Sir John Murray, K.C.B., D.Sc., Ph.D., LL.D., F.R.S., for his important Oceano-

graphical Research, and in commemoration of the completion of his great national work, the Bathymetrical Survey of the Scottish Fresh Water Lochs.

The Society's Gold Medal was conferred on Professor James Geikie, LL.D., D.C.L., F.R.S., for his distinguished services to Geographical Science.

University Medal.

Only one essay was received in competition for the medal offered by the Society in connection with the Lectureship in Geography at Edinburgh University, but this essay was of such excellence that there was no hesitation in awarding the Society's medal to the writer of it, Mr. Thomas M. Steven. The subject of the essay was "A Geographical Description of the County of Ayr."

New Constitution and Laws.

The changes made in the composition of the office bearers of the Society last year having necessitated a revision of the laws, a Committee was appointed for the consideration of that matter. The new Constitution and Laws drafted by this Committee were recommended by the Council for adoption, and after due notice had been given, at a meeting of the Society, of the proposal to adopt the new laws, these new laws were unanimously adopted at a second meeting of the Society held in the Synod Hall, Castle Terrace, Edinburgh, on Tuesday the 11th of July 1911.

Among the changes made by these new laws special attention may be called to the two following :—

(1) Change of Official Year.

The official year of the Society was made to end on the 30th September instead of the 31st October (Law xx). This change was made in order to render it possible for the accounts of the Society to be prepared in time for circulation at an early enough date to allow of their due consideration before the Annual Meeting.

(2) Entrance Fee.

The entrance fee of one guinea for Ordinary Members of the Society re-imposed last year was modified in favour of the members connected with the Glasgow, Aberdeen, and Dundee Centres, the members in connection with which are to pay an entrance fee of only half-a-guinea instead of one guinea as in the case of Edinburgh members (Law xxviii).

Diploma of Fellowship.

There are at present fifty Honorary Fellows and one hundred and fifteen Ordinary Fellows of the Society. During the session the Honorary Diploma was conferred on Laurence Pullar, F.R.G.S., F.R.S.E., in recognition of his work in connection with the Bathymetrical Survey of the Fresh Water Lochs of Scotland, and Sir Ernest H. Shackleton in further recognition of his services to geography in Antarctic Exploration.

The ordinary Diploma of Fellowship was awarded to Mrs. Margaret K. A. Robertson, M.D., L.R.C.P.E., Miss Ella R. Christie, and Dr. J. Ewing Hunter, members of the Society.

Corresponding Members.

Dr. H. Karl W. Kumm, F.R.G.S., was appointed a corresponding member of the Society. The corresponding members number forty-six.

The Society's Magazine.

The *Scottish Geographical Magazine* has, as usual, been published throughout the past session monthly, with maps and illustrations.

The Council is glad to acknowledge its obligations to the contributors of articles, and to the following gentlemen who have rendered valuable assistance to the editors :—Dr. J. G. Bartholomew ; Dr. R. N. Rudmose Brown ; Dr. W. S. Bruce ; Mr. H. M. Cadell ; Mr. Geo. G. Chisholm ; Mr. J. G. Cossar ; Mr. A. L. Cross ; Dr. A. S. Cumming ; Rev. A. K. Dallas ; Mr. H. B. Finlay ; Sir Philip Hamilton Grierson ; Dr. John Gunn ; Mr. W. J. Hardie ; Mr. Lionel Hinxman ; Rev. Dr. Kelman ; Dr. C. G. Knott ; Mr. James Macdonald ; Mr. D. MacRitchie ; Mr. F. J. Martin ; Mr. J. D. Monro ; Mr. T. S. Muir ; Dr. J. H. Harvey Pirie ; Mr. Ralph Richardson ; Dr. Chas. Sarolea ; Dr. J. S. Shand ; Mr. W. C. Smith ; Dr. W. G. Smith ; Mr. W. A. Taylor ; Mr. James Watt ; Dr. J. H. Wigner ; Mr. W. B. Wilson.

Library and Map Department.

During the past session 319 books, 47 pamphlets, 347 reports, 27 atlases, 454 map-sheets and charts have been added to the library. The number of volumes borrowed by members was 3564, and the library was, as usual, much consulted by non-members in search of geographical information.

The Council desires to record its thanks to foreign and colonial governments for the official publications they have presented to the library ; to the Treasury, for the revised Ordnance Survey Maps of Scotland, both in outline and colour, as each of the revisions now in progress is published, and also to the undermentioned private donors of books and maps, viz. :—Dr. Erskine Beveridge ; Mr. Albert P. Brigham ; Mr. A. L. Cross ; Mr. Reginald A. Daly ; Prof. James Geikie ; Dr. Sven Hedin ; Lady Lawson ; Rev. Donald Maclean ; Mr. W. H. Shrubsole ; Mr. Lewis Spence ; the late Mr. Edward Whymper ; Mrs. Fanny Bullock-Workman ; Dr. Wm. Hunter Workman ; Mrs. T. Fisher Unwin ; and Prof. N. Yamasaki.

Glasgow, Dundee, and Aberdeen Centres.

The Council has again the pleasure to acknowledge the services rendered by the honorary officials of the Glasgow, Dundee, and Aberdeen centres for their continued successful conduct of the business of the Society.

Finance.

The Council begs to submit the Annual Financial Statement.

ABSTRACT OF THE ACCOUNTS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY

From 31*st October* 1910 *to* 30*th September* 1911.

FUNDS AT CLOSE OF LAST ACCOUNT:—			
£1000 Glasgow and South-Western Railway Company 4 per cent. Debenture Stock, at cost price, as at 29th May 1885,		£1102 19 9	
£533, 6s. 8d. North British Railway Company 3 per cent. Consolidated Lien Stock, at cost price, as at 30th December 1890,		496 2 0	
£200 Great Central Railway Company 4½ per cent. Debenture Stock, at cost price, as at 31st December 1898,		312 2 9	
£240 North British Railway Company 4 per cent. Consolidated Preference Stock, at cost price, as at 11th December 1902,		306 8 9	
		£2217 13 3	
BALANCES due by Bank:—			
On Account Current,	£27 6 11		
On Deposit Receipt,	304 19 5		
On Do. do. (Glasgow Equipment Fund)	60 19 7		
		393 5 11	
BALANCE due by Treasurer,		0 19 1	
		£2611 18 3	
Less—Subscriptions received applicable to Session 1910-11,		44 2 0	
		£2567 16 3	
SUBSCRIPTIONS from Ordinary Members,	£1972 19 0		
Less— Applicable to Sessions 1911-12 and 1912-13,	12 12 0		
	£1960 7 0		
Do. Life Members,	20 0 0		
Do. Associate Members,	89 15 6		
FEES received for Society's Diploma,	10 10 0		
DIVIDENDS and INTERESTS,	87 17 3		
GOVERNMENT GRANT,	200 0 0		
MISCELLANEOUS,	11 8 8		
ENTRANCE FEES from new Members,	58 16 0		
	2438 14 5		
		£5006 10 8	

MAGAZINE—Expenses of Publication, etc., for Nos. 11 and 12 of Vol. XXVI., and Nos. 1 to 9 of Vol. XXVII.:—			
Printing and other charges,		£602 5 5	
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Maps,		39 9 6	
		£697 5 11	
Less—Magazines sold,	£80 3 8		
Advertising Receipts, less Payments,	42 12 6		
		122 16 2	
		£574 9 9	
GENERAL PRINTING,		47 10 0	
BOOKS and other furnishings for Library,		78 12 2	
RENT OF HALL, and other expenses of Lectures—*Less* Tickets sold,		393 3 9	
GLASGOW BRANCH, Rent of Hall,		15 0 0	
RENT OF COUNCIL ROOM, Taxes, Gas, Repairs, Insurance, etc.,		233 11 4	
SALARIES,		501 1 8	
MISCELLANEOUS, including Stationery, General Expenses, and Postages,		117 11 7	
MEDALS,		16 4 0	
		£1977 4 3	
FUNDS AT CLOSE OF THIS ACCOUNT:—			
£1000 Glasgow and South-Western Railway Company 4 per cent. Debenture Stock at cost price, as at 29th May 1885,	£1102 19 9		
£533, 6s. 8d. North British Railway Company 3 per cent. Consolidated Lien Stock, at cost price, as at 30th December 1890,	496 2 0		
£200 Great Central Railway Co. 4½ per cent. Debenture Stock, at cost price, as at 31st December 1898,	312 2 9		
£240 North British Railway Company 4 per cent. Consolidated Preference Stock, No. 1, at cost price, as at 11th December 1902,	306 8 9		
£400 Dominion of Canada 3½ per cent. Registered Stock, 1930-50, at cost price, 9th March 1911,	405 1 0		
	£2622 14 3		
BALANCE due by Banks:—			
On Account Current,	£53 7 8		
On Deposit Receipt,	304 19 5		
On do. do. (Glasg. Equipment Fund),	60 19 7		
	£419 6 8		
Less due to Treasurer,	0 2 6		
	419 4 2		
	£3041 18 5		
Less—Subscriptions received applicable to Sessions 1911-12 and 1912-13,	12 12 0		
		3029 6 5	
		£5006 10 8	

Edinburgh, 28th October 1911.—I have examined the Accounts of the Royal Scottish Geographical Society for the period ending 30th September 1911, of which the above is an Abstract, and compared them with the Vouchers and Instructions thereof, and I find the same correctly stated and sufficiently vouched and instructed.

P. C. ROBERTSON, M.A., C.A., Auditor.

LIVINGSTONE MEDAL FUND.

FUNDS AT CLOSE OF LAST ACCOUNT:—		
£770 North British Railway Company 4 per cent. Preference Stock No. 1, at cost price,	£999 11 6	
Deposit Receipt with the Commercial Bank of Scotland,	33 1 1	
	£1032 12 7	
Income received—		
Dividend on £770 North British Railway Company 4 per cent. Preference Stock No. 1—		
For half-year to 31st January 1911,	14 9 10	
Note—Owing to the Accounts being closed on 30th Sept., only one-half year's dividend has been received.		
Bank Interest,	0 2 6	
Income-tax recovered,	1 16 4	
	£1049 1 3	

Paid Messrs. Alex. Kirkwood and Son for Medal,	£30 0 0	
Funds at close of this Account—		
£770 North British Railway Company 4 per cent. Preference Stock No. 1, at cost price,	£999 11 6	
Deposit Receipt,	19 9 9	
	1019 1 3	
	£1049 1 3	

Edinburgh, 28th October 1911.—Examined and found correct.

P. C. ROBERTSON, M.A., C.A., Auditor.

INDEX: VOL. XXVII.

In the following Index the ALPHABETICAL ORDER *is adhered to throughout. Titles of Papers are in deeper type. Contraction,* rev. = *Review in the Magazine.*

ABBE, Prof. Cleveland, awarded the Symons Gold Medal, 662.
Aberdeenshire (Mackie), 389.
Abraham, George D., Swiss Mountain Climbs, 168; *rev.*, 325.
—— J. J., The Surgeon's Log, 559; *rev.*, 664.
Abyssinia, Trade of, 560.
Acarnania, Trade of, 390.
Admiralty Charts, Plans, and Sailing Directions, 1911, Catalogue of, 612.
Aërial Postal Service, Establishment of an, 546.
Aeronautical Maps, 528.
Aetolia, Trade of, 390.
Aflalo, F. G., A Fisherman's Summer in Canada, 334; *rev.*, 498.
—— —— Regilding the Crescent, 108; *rev.*, 323.
Africa, An Englishman's Twenty-five years in Tropical (Hawker), 335; *rev.*, 554.
—— British, Report on the Surveys of, 613.
—— Handbook of the Southern Nigeria Survey and Text-Book of Topographical Surveying in Tropical (Guggesberg), 611.
—— in the British Museum, Catalogue of the Fresh-Water Fishes of (Boulenger), 611.
—— In the Heart of (Mecklenberg), *rev.*, 48.
—— J. Craig on Isotherms for, 431.
—— Soda Deposits in East, 100.
—— The Climate of the Continent of (Knox), 667.
—— The Opening up of (Johnston), 447; *rev.*, 607.
—— **The Vegetation of, 375.**
—— "Yakusu," The Very Heart of (Smith), 558; *rev.*, 608.
—— East British, Uganda, and the Sudan, Man and Beast in Eastern Ethiopia, from Observations made in (Bland-Sutton), 612.
—— East, Report for, 168.
—— —— Trade of Portuguese Possessions in, 560.
—— Protectorate, East, Map, 279.
Africa Protectorate, East, Map of, *rev.*, 392.
—— —— —— Trade of, 314.
—— French West, Trade of, 560.
—— German South-West, Trade of, 390.
—— North-Eastern, Glacial Period and Climatic Changes in, 530.
—— South, Spin-drift and Sand-drift: Being a Trip to (Gould), 275; *rev.*, 442.
—— —— To-day, with an Account of Modern Rhodesia (Fyfe), 609.
—— West British, The Agricultural and Forest Products of (Dudgeon), 609.
—— —— Carte de l'Afrique Occidentale Française, *rev.*, 504.
—— —— Geophagy in, 483.
African Game Trails (Roosevelt), *rev.*, 46.
—— Palm-Oil Industry, 603.
—— Tribes, Ethnology of A-Kamba and other East (Hobley), 55; *rev.*, 271.
Afrikas, Die Pflanzenwelt (Engler), *rev.*, 375.
—— Wild und Wilde im Herzen (Schomburgk), 275; *rev.*, 270.
Afrique Equatoriale Française, L' (Rondet-Saint), 667.
Agassiz Memorial Gold Medal, Presentation of, 485.
Agra and Oudh, District Gazetteer of, 108, 336, 613.
Agricultural and Forest Products of British West Africa, The (Dudgeon), 609.
—— Society of Scotland, Transactions of the Highland and, 336.
Aitken, E. H., Gazetteer of the Province of Sindh, 108.
A-Kamba and other East African Tribes, Ethnology of (Hobley), 55; *rev.*, 271.
Akola, District Gazetteer of, 336.
Alaska, Glaciers of, 314.
—— to Mexico, Fifteen Thousand Miles by Stage (Strahorn), 666.
Albert, Lake, Map of, *rev.*, 615.
Alberta, Irrigation in, 483.
Aleppo Vilayet, Trade of, 560.
Alexandria, Trade of, 560.
Algeria. Islam Lands: Nubia, the Sudan, Tunisia, and (Shoemaker), 56.

Algeria. The Mediterranean (Baedeker), 276; *rev.*, 446.
—— Trade and Commerce of, 109, 667.
Aligarh, Gazetteer of, 336.
Almanack, Whitaker's, 107.
Alps, including the Bavarian Highlands, The Eastern (Baedeker), 275; *rev.*, 438.
—— Mr. L. F. Tessier on Distribution of Forest Trees in the Maritime, 148.
—— Scrambles in Storm and Sunshine among the Swiss and English (Armour), 167; *rev.*, 383.
—— **The Architecture and Origin of the. By Prof. James Geikie, LL.D., D.C.L., F.R.S., 393.**
—— The Central (Ball), 559; *rev.*, 552.
—— **The Northern Limit of the Olive in the French, 87.**
—— to the Apennines. Through the (Konody), 336; *rev.*, 492.
Amazon, Rubber Collection on the, 316.
Amazone, Du Ria Sao Francisco a l', 108.
America: A History and Description of the British Empire in America (Bradley); 612.
—— Across South (Bingham), 609.
—— Crop Possibilities of the Great Plains of, 484.
—— Economic Importance of the Plateaux of Tropical, 432.
—— from Bogota to Manos, A Journey Across South, Lecture by Dr. Hamilton Rice, 93.
—— Geography Notes (Chute), 335.
—— North, Outlines of Geologic History with Especial Reference to (Salisbury), *rev.*, 52.
—— South, The True History of the Conquest of New Spain (Diaz), *rev.*, 49.
—— **The Norsemen in, by Dr. Fridtjof Nansen, G.C.V.O., 617.**
—— To-Day, South (Clemenceau), 610.
American Geographers, Association of, 265.
—— Indians, Handbook of (Hodge), 277.
—— Prairies, Treelessness of the, 431.
—— Rambles with an (Tearle), *rev.*, 44.
Americanists, International Congress of, 662.
Amoy, Trade of, 448.
Amraoti, Gazetteer of, 336.
Amsterdam, Trade of, 336.
Amundsen's, Captain, Antarctic Expedition, 264, 377, 661.
Amurath to Amurath (Bell), 108; *rev.*, 217.
Ancona, Trade of, 613.
Anderson, R. C., Canoeing and Camping Adventures; being an Account of Three Cruises in Northern Waters, *rev.*, 102.
Andes du Pérou, Détermination de l'Altitude du Mont Huascaran (Bullock-Workman), 276; *rev.*, 484.
Andine Glaciers, Argentine Plains and (Larden), 335; *rev.*, 497.
Andrews, A. W., Notes on the Orographical Map of Europe, 277; *rev.*, 267.
Angola, Trade of the Province of, 109, 613.
Animals and Kindred Subjects, Stray Leaves on Travel, Sport (Walter), *rev.*, 222.
Annual Business Meeting, 600, 656.
—— Report, 668.
Antarctic Expedition, British, 39, 263.
—— —— Captain Amundsen's, 264, 377, 661.
—— —— Dr. Mawson's, 100, 264, 378.
—— —— Results of French, 38.
—— —— **The Second French. By Dr. J. B. Charcot, 113.**
—— —— German, 99, 314, 485, 661.
—— —— Japanese, 151, 314.
—— Station, Argentine, 377.
—— The Voyage of the *Why Not?* in the (Charcot), 334; *rev.*, 443.
Antarctique, Le Pourquoi-Pas? dans l' (Charcot), 56; *rev.*, 106.
Anthropo-Geography, Influences of Geographic Environment on the Basis of Ratzel's System of (Semple), 609.
Antofagasta, Trade of, 336.
Antwerp, Shipping of, 336.
Apennines, Through the Alps to the (Konody), 336; *rev.*, 492.
Appalachian Region, Denudation and Erosion in the Southern, 474.
Appin on Tayside, Notes on Changes in the Highland District of. By John Stewart, Jr., 281, 359.
Araber, Die Kultur der (Hell), 444.
Arber, Dr., on the relation of the present plant population of the British Isles, 521.
Architectural Association, Transactions of the Edinburgh, 336.
Arctic Exploration in Early Times, In Northern Mists (Nansen), 666.
—— Islands and Hudson Strait on board the D.G.S. *Arctic*. Report on the Dominion of Canada Government Expedition to the (Bernier), 447.
—— Regions, Distribution of land in, 433.
—— Seas, The Toll of the (Edwards), 167; *rev.*, 271.
Arctique de 1907, Campagne (D'Orléans), 447.
Arctiques, Chasses et Chasseurs (Orléans), 389.
Ardgoil, The Plant-Geography of. By Thomas Nisbet, M.A., 449.
Argentina, Artesian Waters of, 149.
—— M. Pierre Denis on Distribution of Agricultural produce in, 204.
Argentine Antarctic Station, 377.
—— Plains and Andine Glaciers (Larden), 335; *rev.*, 497.
—— Republic, Finance of the, 390.
Armenien, eine Wanderung und der Zug Xenophon's bis zum Schwarzen-Meere, Durch (Hoffmeister), 611.
Armour, R. C., Scrambles in Storm and

Sunshine among the Swiss and English Alps, 167 ; *rev.*, 383.
Artesian Waters of Argentina, 149.
Arthur's Seat Volcano, Description of, (Peach), 389 ; *rev.*, 491.
Ashanti, Report for, 448.
Asia and Europe (Townsend), 611.
—— Central, Evolution of the Relief of, 312.
—— Russian, Railways in, 317.
—— The Heart of (Curtis), 609.
Assam, Gazetteers of Eastern Bengal and, 336, 613.
Asturias, Trade of, 390.
Atlases, New Maps and, 109, 277, 504, 613.
Attock District Gazetteer, 336.
Aubrey Le Blond, Mrs., Mountaineering in the Land of the Midnight Sun, *rev.*, 212.
Austen, Ernest, A Handbook of the Tsetse-Flies, 611.
Australia in its Physiographic and Economic Aspects (Taylor), 168.
—— Official Year-Book of the Commonwealth of, 559.
Austria, The Eastern Alps, including the Bavarian Highlands, Tyrol, Salzburg, Upper and Lower (Baedeker), 275 ; *rev.*, 438.
Austria-Hungary, Finances of, 560.
—— —— Foreign Trade of, 56, 613.
—— —— Handbook for Travellers (Baedeker), 610.
Avignon, The Story of (Okey), 667.
Awards, Royal Geographical Society's, 265.
Ayrshire, Cambridge County Geographies (Foster), 55.
—— Ordnance Survey of, *rev.*, 110.
Azores, Trade and Commerce of, 390.

Bacon's Contour Hand-Maps, *rev.*, 391.
Baden, Trade of the Grand Duchy of, 560.
Baedeker, Karl, Austria-Hungary, 610.
—— —— The Eastern Alps, 275 ; *rev.*, 438.
—— —— The Mediterranean : including Madeira, the Canary Islands, etc., 276 ; *rev.*, 446.
—— —— The Rhine, including the Black Forest and the Vosges : Handbook for Travellers, 223 ; *rev.*, 384.
Baghdad, Trade of, 448.
Bagot, Richard, My Italian Year, 610.
Bahamas, Report on, 560.
Bahia, Trade of, 390.
Bahrein Islands, Trade of, 56.
Bailey, E. B., The Glaciation of East Lothian South of the Garleton Hills, 559.
Bain, George, The River Findhorn from Source to Sea, 609.
Baker, Captain B., The Danube with Pen and Pencil, 275 ; *rev.*, 384.
Balaton, Resultate der wissenschaftlichen Untersuchungen des, 56.
Ball, J. Dyer, The Chinese at Home, 559.
—— John, The Central Alps, 559 ; *rev.*, 552.
Baltimore, Trade of, 336.
Banff, Ordnance Survey of, *rev.*, 110.
Bangalore, Report on, 168.
Bankok, Trade of, 109.
Banse, E., on Drainage Systems, 315.
Barbares, Chine, Tibet, Mongolie, Les Derniers (D'Ollone), 275 ; *rev.*, 439.
Barcelona, Trade and Commerce of, 448.
Barnard, H. Clive, Europe in Picture, 388 ; *rev.*, 552.
Barrett, John, Mexico : A General Sketch, 558.
Barrow, Mrs. K. M., Three Years in Tristan da Cunha, *rev.*, 48.
Bartholomew, Dr. J. G., Atlas of Zoogeography, *rev.*, 200, 280.
—— —— Survey Atlas of Scotland, 263.
Bartholomew's "Half-inch to Mile Map" of England and Wales, *rev.*, 614.
—— Quarter-inch to Mile Map of London District, *rev.*, 503.
—— Quarter-inch to Mile Map of Scotland, *rev.*, 503.
—— The Comparative Atlas, Physical and Political, *rev.*, 616.
Baschin, Otto, Bibliotheca Geographica, 559.
Basra, Trade of, 560.
Basutoland, Map of, *rev.*, 615.
—— Report for, 448.
Batoum, Trade of, 448, 613.
Bavarian Highlands, The Eastern Alps, including the (Baedeker), 275 ; *rev.*, 438.
Bavaria, Trade of, 613.
Beasts and Birds : A Nature Book for Boys and Girls (Wyss), 56 ; *rev.*, 331.
Bebey, Map of, 279.
Beckett, Arthur, The Wonderful Weald, 559.
Beebe, Mary Blair and C. William, Our Search for a Wilderness : An Account of two Ornithological Expeditions to Venezuela and to British Guiana, *rev.*, 49.
Beech, Mervyn W. H., The Suk : Their Language and Folklore, 559.
Beet-sugar Industry, British, 531.
Behar District Gazetteer, 336.
Beirut, Trade of, 560.
Bell, Aubrey, F. G., The Magic of Spain, 610.
—— Gertrude, Amurath to Amurath, 108 ; *rev.*, 217.
Belgium (Grieben), *rev.*, 438.
Belgium and the North-East of France, Map of, *rev.*, 391.
—— Trade and Commerce of, 667.
Bengal and Assam, Gazetteers of, 108, 336, 613.
Berkshire (Cambridge County Geographies), (Monckton), 275.

Berkshire, The Place-Names of (Skeat), 275; *rev.*, 606.
Bernese Oberland in Summer and Winter, The (Grandeo), 167; *rev.*, 325.
Bernier, Captain J. E., Report on the Dominion of Canada Government Expedition to the Arctic Islands and Hudson Strait, on board the D.G.S. *Arctic*, 447.
Berwick, First Report and Inventory of Monuments and Constructions in the County of, 560.
—— The Geology of East Lothian, including Parts of the Counties of Edinburgh, and (Clough), 109.
Besley, Mr., on the Vegetation of Maryland, 1.
Betham-Edwards, Miss, In the Heart of the Vosges, 611.
—— —— Unfrequented France by River and Mead and Town, *rev.*, 103.
Beveridge, Erskine, North Uist: Its Archæology and Topography, with Notes upon the Early History of the Outer Hebrides, 612.
Beverley, Captain, Central and Eastern Provinces of Southern Nigeria, *rev.*, 35.
Bevis, J. F., and H. J. Jeffrey, British Plants, 558; *rev.*, 608.
Bilaspur, District Gazetteer of, 336.
Bilbao, Trade of, 613.
Bingham, Hiram, Across South America, 609.
Birbhum: Bengal District Gazetteers (O'Malley), 108.
Birds, Beasts and, A Nature Book for Boys and Girls (Wyss), 56; *rev.*, 331.
Bishop, Avary, Physical and Commercial Geography, *rev.*, 165.
Biskra: A Practical Handbook for Travellers (Hyam), *rev.*, 329.
Blache, Prof. Vidal de la, On Modes of Life in Human Geography, 486.
Black Forest and the Vosges: Handbook for Travellers, The Rhine, including the (Baedeker), 223; *rev.*, 384.
—— —— Rambles in the (Wylie), 558.
Black's Geographical Pictures, 102.
—— School Geography: Geographical Pictures, 55.
Blackfeet Indians: The Old North Trail; or, Life, Legends, and Religion of the (M'Clintock), *rev.*, 49.
Blanchard, R., On the Northern Limit of the Olive in the French Alps, 87.
Bland-Sutton, J., Man and Beast in Eastern Ethiopia, 612.
Bleek, W. H. L., and L. C. Lloyd, Specimens of Bushman Folklore, 609.
Bluejackets, My Life among the (Weston), 275.
Blyth, Robert, Diploma of Fellowship awarded, 655.
Board of Trade Reports: Iron and Steel, 109.
Bogota to Manaos, A Journey Across South America from. Lecture by Dr. Hamilton Rice, 93.
Bogra District Gazetteer, 336.
Bohemia and the Čechs (Monroe), *rev.*, 157.
Bokhara and his Country, The Emir of, Journeys and Studies in Bokhara (Olufsen), 667.
Bolivar, Ciudad, Trade of, 390.
Bolivia, The Geography and Natural Resources of, 6.
—— Trade of, 560.
Bonacina, L. C. W., Climate Control, 609.
Books, New, 44, 102, 155, 209, 267, 321, 382, 438, 489, 551, 606, 663.
—— **Received, 55, 107, 167, 223, 275, 334, 388, 447, 558, 609, 666.**
Bordeaux, Trade of, 390.
Borneo, Seventeen Years among the Sea Dyaks of (Gomes), 168; *rev.*, 328.
Borup, George, A Tenderfoot with Peary, 609.
Bosnia-Herzegovina, Trade of, 390.
Boule, M., La Haute Loire, 335; *rev.*, 491.
Boulenger, George, Catalogue of the Fresh-Water Fishes of Africa in the British Museum, 611.
Boston, Trade and Commerce of, 448.
Bradley, Arthur, A History and Description of the British Empire in America, 612.
Bradley-Birt, F. B., Chota Nagpore, *rev.*, 45.
Brazil (Denis), 224.
—— Rubber Industry of, 316.
—— The United States of (Domville-Fife), *rev.*, 50.
Brenier, H., L'Indo-Chine Française, 335; *rev.*, 441.
Brésil, Au, de L'Uruguay au Rio São Francisco (Wall), *rev.*, 219.
—— Au, Rio São Francisco à l'Amazone (Wall), 108.
Brigham, Albert Perry, Commercial Geography, 559.
Britain on and beyond the Sea (Crofts), 447.
British Antarctic Expedition, 39, 263.
—— Association, 435.
—— —— 1912 Meeting, 531.
—— —— Election of Office-Bearers, 152.
—— —— **The Meeting of the, 516.**
—— Colonies, A Historical Geography of the (Rogers), 447.
—— Columbia, Irrigation in, 483.
—— **Empire, Cotton-Growing within the. By J. Howard Reed, F.R.G.S., 242.**
—— —— in the East and South, and Japan, An Eastern Voyage: A Journal of Travels through the (Hochberg), 224; *rev.*, 273.
—— —— The (Heaton), 447.
—— Isles, Geographical Diagrams and Land Forms, with Questions, Statistics, and Tables, The (Snape), 224; *rev.*, 321.

British Isles, Relation of the Present Plant Population of the, 521.
—— —— The (Geography Notes—Chute), 335.
—— —— The Building of the (Jukes-Browne), 108 ; *rev.*, 211.
—— Rainfall 1910 (Mill), 559.
—— Vegetation, Types of (Tansley), 612.
—— **Work in Spitsbergen : Some Historical Notes. By R. N. Rudmose Brown, D.Sc., 180.**
Brittany, Tourist Handbook for Normandy and (Cook), 438.
Bradford District, Geological Survey of, *rev.*, 110.
Broad Stone of Empire, The (Bruce), *rev.*, 53.
Brogett, Mr., On the Vegetation of Maryland, 1.
Broom, Admiralty Chart of Loch, *rev.*, 391.
Broomhall, Marshall, Islam in China, 55 ; *rev.*, 158.
Brotchie, T. G. F., Some Sylvan Scenes near Glasgow, *rev.*, 157.
Brown, George, D.D., Melanesians and Polynesians, *rev.*, 51.
—— Rev. J. Wood, Florence Past and Present, 223 ; *rev.*, 323.
—— **R. N. Rudmose, D.Sc., British Work in Spitsbergen : Some Historical Notes, 180.**
—— W. C., The New Outlook Geography, 334 ; *rev.*, 445.
—— —— The Home of Man, 276 ; *rev.*, 445.
Browne, Edith A., Sugar (Peeps at Industries), 612.
Bruce, Sir Charles, The Broad Stone of Empire, *rev.*, 53.
—— Dr. W. S., Polar Exploration, 275 ; *rev.*, 443.
—— **Wm. S., LL.D., F.R.S.E., The Prince of Monaco and Oceanographical Research, 142.**
Brunhes, Professor J., on Coast Erosion, 154.
—— —— referred to, 565.
Buchanan, J. Y., Society's Gold Medal awarded to, 655.
Buenos Aires to Lima. Across South America : An Account of a Journey from (Bingham), 609.
—— —— Trade of, 613.
Bulawayo : Ethnological Section, Rhodesia Museum (Hall), 560.
Buldana, District Gazetteer of, 336, 613.
Bulgaria, Trade of, 109.
Bull, Charles, Under the Roof of the Jungle : A Book of Animal Life in the Guiana Wilds, 611.
Bullock-Workman, F., Détermination de l'Altitude du Mont Huascaran, 276; *rev.*, 484.
Bululu, Map of, *rev.*, 615.
Burdwan, District Gazetteer of, 336.
Burma : A Handbook of Practical information (Scott), 388.
—— Gazetteers, 613.
—— Map of Myingyan District, *rev.*, 615.
—— Report on, 168.
Burmese Self-Taught (St. John), 334.
Burrard, Colonel S. G., Levelling of Precision in India, 667.
Bushire, Trade of, 109.
Bushman Folklore, Specimens of (Bleek), 609.
Butcher, E. L., Egypt as We Knew It, 108 ; *rev.*, 219.
—— Mr. S. H., Obituary Notice, 94.
Bute, Island of, Exhibition of Model, 380.

Cabaton, A., Java, Sumatra, and the Other Islands of the Dutch East Indies, 609.
Caiani, Capt. A., English and Italian Military Terms, 276.
Caicos Island, Report on, 560.
Caithness considered in Relation to the Geology, The Vegetation of (Compton), 667.
Calais, Trade of, 390.
California, The Channel Islands of (Holder), *rev.*, 164.
Calvert, Albert F., Nigeria and its Tin Fields, 108 ; *rev.*, 218.
—— —— The Traveller's Handbook for Spain, 666.
Campbell, Wilfred, The Beauty, History, Romance, and Mystery of the Canadian Lake District, 666.
Cambridge and Ely, Highways and Byways in (Conybeare), *rev.*, 211.
Canada, A Fisherman's Summer in (Aflalo), 334 ; *rev.*, 498.
—— and Boards of Trade Register, The Commercial Handbook of (Heaton), 167 ; *rev.*, 220.
—— Irrigation in, 483.
—— Old Indian Trails : Incidents of Camp and Trail Life, covering Two Years' Explorations through the Rocky Mountains of (Schaffer), 610.
—— Statistics of the Dominion of, 612.
—— **The Colonisation of Western, 196.**
—— The Fair Dominion (Vernide), 389 ; *rev.*, 442.
—— The Golden Land : The True Story and Experiences of British Settlers in (Copping), 276 ; *rev.*, 442.
—— Western, Map of, *rev.*, 111.
Canadian Lake District, The Beauty, History, Romance, and Mystery of the (Campbell), 666.
—— Railway, The Making of a Great (Talbot), 666.
—— Rockies, New and Old Trails, The (Coleman), 666.
Canal Projects in the Isthmus of Panama and Adjacent Regions. By H. J. Peddie, 13.

Canary Islands, The Mediterranean (Baedeker), 276 ; *rev.*, 446.
—— —— Trade of the, 390.
Canoeing and Camping Adventures : being an Account of Three Cruises in Northern Waters (Anderson), *rev.*, 102.
Canterbury, Local Time in, 551.
Canton, Trade of, 560.
Caracas, Trade of, 560.
Carey, W. Maclean, A First Book of Physical Geography, *rev.*, 223.
Carinthia, The Eastern Alps, including (Baedeker), 275 ; *rev.*, 438.
Carniola, The Eastern Alps, including (Baedeker), 275 ; *rev.*, 438.
Carolines, Uap of the : The Island of Stone Money (Furness), *rev.*, 51.
Carruthers, Mr., Expedition to North-West Mongolia, 94.
Carson, Norma Bright, From Irish Castles to French Chateaux, *rev.*, 156.
—— Thomas, Ranching, Sport, and Travel, 667.
Cartagena, Trade and Commerce of, 109, 613.
Caucasus, Casuals in the (Herbert), 610.
Cave, Henry W., The Ceylon Government Railway, 56 ; *rev.*, 215.
Čechs : Bohemia and the (Monroe), *rev.*, 157.
Central Provinces District Gazetteers, 108, 336, 613.
Ceylon, Knox's, 479.
—— An Historical Relation of (Knox), 335 ; *rev.*, 479.
—— Government Railway, The (Cave), 56 ; *rev.*, 215.
—— Report on the Surveys of, 613.
Chaix, Prof. Emile, on Coast Erosion, 154.
Chamba State Gazetteer, 108.
Chamberlain, T. C., on Glacial Erosion, 603.
Chamonix and the Range of Mont Blanc, A Guide to (Whymper), 559 ; *rev.*, 491.
Changsha, Trade of, 560.
Channel in the *Vivette*, Down (Chatterton), *rev.*, 45.
—— Islands of California, The (Holder), *rev.*, 164.
Charcot, Dr. J. B., awarded the Patron's Medal, 265.
—— —— Le Pourquoi-Pas? dans l'Antarctique, 56 ; *rev.*, 106.
—— —— Results of French Antarctic Expedition, *rev.*, 38.
—— —— **The Second French Antarctic Expedition, 113.**
—— —— The Voyage of the *Why Not?* in the Antarctic, 334 ; *rev.*, 443.
Charts, Atlas of Portolan (Stevenson), *rev.*, 504.
Chatterton, E. Keble, Down Channel in the *Vivette*, *rev.*, 45.
Chattisgarh Feudatory States Gazetteer, 336.
Chefoo, Trade of, 448.
Chicago, Trade and Agriculture of, 560.
Chiengmai, Trade and Commerce of, 560.
Chignell, Rev. A. K., An Outpost in Papua, 334 ; *rev.*, 498.
Chile, Trade of, 560.
Chinkiang, Trade of, 336.
China, Among the Tribes in South-West (Clarke), 335 ; *rev.*, 553.
—— Eighteen Capitals of (Geil), 611.
—— Changing (Gascoyne-Cecil), 276 ; *rev.*, 492.
—— Half a Century in (Moule), 276 ; *rev.*, 385.
—— Islam in (Broomhall), 55 ; *rev.*, 158.
—— Map showing the Stations of the China Inland Mission, *rev.*, 392.
—— showing Railways, Telegraphs, and Treaty Ports, Map of, *rev.*, 110.
—— The Civilisation of (Giles), 667.
—— Trade of, 560.
Chinde, Trade, etc., of, 448.
Chine, La Grande Artère de la (Dautremer), 276 ; *rev.*, 440.
—— Tibet, Mongolie, Les Derniers Barbares (D'Ollone), 275 ; *rev.*, 439.
Chinese at Home, The (Ball), 559.
—— Mines, Memorandum on, 448.
Chinois, Kientchang et Lolotie, Le Far-West (Legendre), *rev.*, 213.
Chisholm, Geo. G., M.A., B.Sc., Density of Population, Scotland, 1911, 466.
—— —— Europe, Vol. II., The North-West, 168.
—— —— **Some Recent Contributions to Geography, 561.**
Chota Nagpore : A little-known Province of the Empire (Bradley-Birt), *rev.*, 46.
Christian, F. W., Eastern Pacific Lands, Tahiti and the Marquesas Islands, *rev.*, 164.
Christie, Miss Ella R., Diploma of Fellowship conferred on, 263.
Chronometer, Homan's Solar, 91.
Chrysler, Mr., on the Vegetation of Maryland, 1.
Chumpann, Trade of, 277.
Chungking, Trade of, 448.
Chute, J. C., America (Geography Notes), 335.
—— —— The British Isles (Geography Notes), 335.
Chypre, L'Enseignement en (Delaporte), 56.
Civilisations, Beginnings : or Glimpses of Vanished (Mulhall), 335 ; *rev.*, 446.
Clarke, S. R., Among the Tribes in South-West China, 335 ; *rev.*, 553.
—— W. Eagle, A New Atlas of Zoogeography, *rev.*, 200.
Clemenceau, George, South America To-Day, 610.
Clerget, P., On the Lotschberg Tunnel Railway Route, 549.
Clifton, Mrs., Pilgrims to the Isles of

Penance : Orchid-gathering in the East, 610.
Climate Control (Bonacina), 609.
—— Mr. F. Thorbecke, On The Sub-Tropical, 206.
Climates, Prof. Penck on New Classification of, 152.
Climatic Change, Possibility of, 435.
—— Variation, Mr. Ellsworth Huntington on the Oasis of Khara and, 97.
Climbing Adventures in Four Continents, My (Turner), 609.
Close, Colonel C. F., C.M.G., R.E., The Purpose and Position of Geography, 505.
—— —— Appointed Director-General of the Ordnance Survey, 548.
—— —— On Aeronautical Maps, 530.
—— —— Referred to, 562.
Clough, C. T., The Geology of East Lothian, including Parts of the Counties of Edinburgh and Berwick, 109.
—— C. T., The Geology of the Glasgow District, 612.
Clowes, E. M., On the Wallaby through Victoria, 559.
Coast Erosion Commission, Report of the, 482.
Cockayne, L., Report on the Dune-Areas of New Zealand: their Geology, Botany, and Reclamation, 612.
Coleman, A. P., The Canadian Rockies: New and Old Trails, 666.
Colima, Trade of, 390.
Collier, Price, The West in the East from an American Point of View, 389; *rev.*, 493.
Collins, W. W., Cathedral Cities of Italy, 610.
Colonial Import Duties, 56.
Colonies, Indentured Labour in Tropical (Wylie), 560.
Colonisation of Western Canada, The, 196.
Colonsay and Oronsay, with Part of the Ross of Mull, The Geology of (Craig, Wright, and Bailey), 612.
—— One of the Hebrides (M'Neil), *rev.*, 210.
Columbia, British, Report on, 151.
Commercial Geography (Robinson), 56; *rev.*, 501.
—— —— Physical and (Gregory, Keller, and Bishop), *rev.*, 165.
Comparative Atlas, The Physical and Political (Bartholomew), *rev.*, 616.
Compton, C. B., The Vegetation of Caithness considered in Relation to the Geology, 667.
—— E. T., Les Chemins de Fer Kassa-Oderberg et la Haute-Tatra, 448; *rev.*, 551.
Congo, A Voice from the (Ward), *rev.*, 47.
—— Notes Ethnographiques sur les peuples communément appelés Bakuba (Torday et Joyse), 336.
—— Trade and Resources of, 613.
Congo-Belge, Carte du, *rev.*, 392.
—— French, Territorial Changes in the, 659.
Congress, Report of Library of, 224.
Constantinople. Venice in the Thirteenth and Fourteenth Centuries; A Sketch of Venetian History from the Conquest of (Hodgson), *rev.*, 212.
Continents, My Climbing Adventures in Four (Turner), 609.
Conybeare, Rev. E., Highways and Byways in Cambridge and Ely, *rev.*, 211.
Cook, Dr. F. A., My Attainment of the Pole, 609.
Cook's Tourists' Handbook for Normandy and Brittany, *rev.*, 438.
Cooper, B., On Aeronautical Maps, 530.
—— T. P., The History of the Castle of York, 559.
Copping, Arthur E., The Golden Land, 276; *rev.*, 442.
Coquimbo, Trade of, 336.
Corea, Trade of, 390.
Corfu, Trade of, 390.
Corsica, Trade of, 448.
Cornwall, Nooks and Corners of (Scott), 558.
Cossar, James, M.A., F.R.G.S., Notes on the Geography of Edinburgh District, 574, 643.
Costa Rica, Trade and Commerce of, 667.
Cotton-growing within the British Empire. By J. Howard Reed, F.R.G.S., 242.
—— —— —— Mr. Howard Reed, Lecture by, 147.
—— Supply, India with Respect to the World's, 531.
Coventry, The Story of (Harris), 609.
Cowles, Dr. H. C., on Origin and Destiny of the Everglades, 265.
—— —— on the Causes of Vegetative Cycles, 265.
Craig, E. H., The Geology of Colonsay and Oronsay, with Part of the Ross of Mull, 612.
—— J. I., on the Glacial Period and Climatic Changes in North-Eastern Africa, 530.
—— Stirling, Secrets of the Hills and How Ronald Read them, 611.
Crescent, Regilding the (Aflalo), 108; *rev.*, 323.
Crete, Trade of, 109, 613.
Crofts, Cecil H., Britain on and Beyond the Sea, 447.
Cross, A., The Lands of the West, 610.
—— **A. L., A Visit to Lapland, 78.**
Cuba, Trade of the Island of, 448.
Curle, James, A Roman Frontier Post and its People: The Fort of Newstead in the Parish of Melrose, 108; *rev.*, 213.
Curtis, Eleroy, Turkestan, 609.
Curzon and After, India under (Fraser), 610.
Cyclades, Trade of, 390.
Cyprus, Report on the Surveys of, 613.

Cyzicus: Being some Account of the History and Antiquities of that City (Hasluck), 55; *rev.*, 214.

Dairen, Trade and Navigation of the Port of, 667.
Daly, Reginald A., The Nature of Volcanic Action, 560.
Damascus, Trade of, 667.
Danube with Pen and Pencil, The (Baker), 275; *rev.*, 384.
Darwin, Major Leonard, Lecture by, 655.
Dautremer, J., La Grande Artère de la Chine, 276; *rev.*, 440.
Davis, H. W. C., Mediæval Europe, 447; *rev.*, 552.
—— Wm. Morris, Geographical Essays, 224; *rev.*, 266.
Dawkins, Prof. W. B., on the Pre-History of Wales, 601.
Delaporte, Professeur René, L'Enseignement en Chypre, 56.
Demagerim, Map of, 279.
Demangeon, Prof., on Life in a French Upland Region, 532.
Dengi, Map of, 279.
Denis, Pierre, Brazil, 224.
—— —— on the Distribution of Agricultural Produce in Argentina, 204.
Denmark, Trade of, 336.
—— Finances of, 336.
Dennett, R. E., Nigerian Studies: or the Religious and Political System of the Yoruba, *rev.*, 162.
Dennis, J. S., Lecture by, 37.
Denudation and Erosion in the Southern Appalachian Region, 474.
Desert Islands, A Naturalist on (Lowe), 666.
Deutsch-Japanischen Umgangssprache Wörterbuch der (Seidel), 447.
Deutscher Kolonial Atlas, Grosser, *rev.*, 112.
Devon and Dorset Coast, The South (Heath), *rev.*, 103.
Diaz, Bernal, The True History of the Conquest of New Spain, *rev.*, 49.
Dickinson, B. B., Notes on the Orographical Map of Europe, 277; *rev.*, 267.
Dingelstedt, Victor, Ruling Nations: Considerations on their Characters, 291.
D'Ollone, Commandant, Les Derniers Barbares, Chine, Tibet, Mongolie, 275; *rev.*, 439.
Dolomites, The (Grieben's Guide Books), 335; *rev.*, 438.
Domville-Fife, W., The United States of Brazil, *rev.*, 50.
Dorset Coast, The South Devon and (Heath), *rev.*, 103.
Douglas, Norman, Siren Land, 223; *rev.*, 322.
Drake-Brockmann, D. L., District Gazetteer of Agra, 336, 613.
Drug District, Gazetteer of, 613.
Dudgeon, Gerald C., The Agricultural and Forest Products of British West Africa, 609.
Dunblane, The Battle of (Shearer), 560.
Dusseldorf, Trade of, 448.
Dutch East Indies, Java, Sumatra, and the Other Islands of the (Cabaton), 609.
—— New Guinea, Goodfellow's Expedition to, 206.
Dwerryhouse, A. R., The Earth and its Story, *rev.*, 333.

Earth and its Story, The (Dwerryhouse), *rev.*, 333.
East, Changes and Problems in the Near (Woods), 276.
—— from an American Point of View, The West in the (Collier), 389; *rev.*, 493.
—— The Surgeon's Log: Being Impressions of the Far (Abraham), 559; *rev.* 664.
Eastern Miscellany, An (Ronaldshay), 275; *rev.*, 438.
—— Voyage: A Journal of Travels through the British Empire in the East and South, and Japan, An (Hochberg), 224; *rev.*, 273.
Echigo, Report on the Oil Industry of, 336.
Economic Geology (Ries), *rev.*, 53.
Edgar, John, The Great Pyramid Passages and Chambers, 56; *rev.*, 332.
Edinburgh Architectural Association, Transactions of the, 336.
—— and Berwick: The Geology of East Lothian, including Parts of the Counties of (Peach), 109.
Edinburgh District, Notes on the Geography of. By James Cossar, M.A., F.R.G.S., 574, 643.
—— Geological Survey of, *rev.*, 110.
—— Geology of the Neighbourhood of (Peach and others), 109; *rev.* 307.
—— Romantic (Geddie), 559.
—— **The Geology of, 307.**
Edwards, Deltus M., The Toll of the Arctic Seas, 167; *rev.*, 271.
Educational, 42, 100, 154, 208, 266, 317, 380, 550, 604, 662.
Egypt and the Egyptian Sudan, Karte von (Saint-Martin), *rev.*, 111.
Egypt as we Knew it (Butcher), 108; *rev.*, 219.
—— **From Hausaland to. By Dr. Karl W. Kumm, 225.**
—— The Movements of the Subsoil Water in Upper (Ferrer), 277.
—— Through the Sudan, From Hausaland to (Kumm), 107; *rev.*, 218.
Elba, Trade of, 613.
Eldorado, 368.
Ely, Highways and Byways in Cambridge and (Conybeare), *rev.*, 211.
Empire, The Broad Stone of (Bruce), *rev.*, 53.
Endle, Rev. Sidney, The Kacharis, 558; *rev.*, 663.

England, Nooks and Corners of Old (Fea), 389; *rev.*, 492.
—— Johnston's Bathy-orographical Map of, *rev.*, 614.
—— and Wales, Bartholomew's "Half-inch to Mile Map," *rev.*, 614.
Engler, A., Die Pflanzenwelt Afrikas, 107; *rev.*, 375.
Enock, C. Reginald, Farthest West, Life and Travel in the United States, *rev.*, 50.
Erdkunde, Grundzuge der Physischen (Supan), 609.
Erosion Committee, Report of the Coast, 482.
—— Coast, Prof. Emile Chaix on, 154.
Erzeroum, Trade of, 560.
Eskimos in Westgronland, Bei den (Trebitsch), *rev.*, 221.
Etherton, Lieut. P. T., Across the Roof of the World, 168; *rev.*, 215.
Ethiopia, Man and Beast in Eastern (Bland-Sutton), 612.
Europe (Snape), 224; *rev.*, 385.
—— a Scientific Geography (Heaton), 276.
—— and its Peoples (Palmer), 168; *rev.*, 267.
—— and the Mediterranean Region (Reynolds), 334; *rev.*, 489.
—— Asia and (Townsend), 611.
—— Bathy-orographical Map of (Johnston), *rev.*, 391.
—— in Pictures (Barnard), 388; *rev.*, 552.
—— Mediæval (Davis), 447; *rev.*, 552.
—— Stanford's Compendium (Chisholm), 168.
—— The Danger Zone of (Woods), 276; *rev.*, 332.
Everglades, Origin and Destiny of the, Dr. H. C. Cowles on, 265.
Exhibition of Natural History and Industry, Scottish, Loan of Maps, 147.

Fairgrieve, J., A Class-book of Practical Geography, 610; *rev.*, 662.
Falconer, Dr. J. D., appointed Lecturer in Geography at Glasgow University, 604.
—— —— On Horseback through Nigeria, or Life and Travel in the Central Sudan, 666.
—— —— The Geology and Geography of Northern Nigeria, 335; *rev.*, 554.
Falkland Islands, Report on, 560.
Faroe Islands, Trade of, 560.
Fawcett, William, Flora of Jamaica, 611.
Fea, Allan, Nooks and Corners of Old England, 389; *rev.*, 492.
Ferguson, Rev. John, Linlithgow Palace: Its History and Traditions, *rev.*, 155.
—— W. M., Adventure, Sport and Travel on the Tibetan Steppes, 276; *rev.*, 494.
Ferrar, H. T., Movements of the Subsoil Water in Upper Egypt, 277.
Ferriman, Z. D., Home Life in Hellas, *rev.*, 157.
Ferriman, Z. D., Turkey and the Turks, 610.
Fiegel, Max D., Der Panamakanal, Die Bedeutung des Kanalbaues, 667.
Field Geology for Students of Pure and Applied Science, Structural and (Geikie), 224.
Fiji, Report for, 613.
—— Report on the Surveys of, 613.
Filchner, Lieut., German Antarctic Expedition, 99, 485, 661.
Finch, Robert J., Questions and Exercises in Geography. The World: General Mathematical, Physical, and Economic Geography, 609.
Findhorn from Source to Sea, The River (Bain), 609.
Findlay, H. J., The New Outlook Geography, 334; *rev.*, 445.
Finland, Letters from (Travers), 335; *rev.*, 490.
—— To-day (Renwick), 224; *rev.*, 384.
—— Trade of, 390.
Finlande, Atlas de, 610; *rev.*, 616.
Finnish Self-Taught (Thimm's System), (Renfors), *rev.*, 274.
Fischer, Prof., on the Limit of the Olive in the French Alps, 87.
Fishery Board for Scotland, Twenty-Ninth Annual Report of the, 390.
Fishes of Africa in the British Museum, Catalogue of the Fresh-Water (Boulenger), 611.
Fiume, Trade of, 613.
Fletcher, F. W. F., Sport on the Nilgiris and Wynaad, 612.
—— J. S., Nooks and Corners of Yorkshire, 389; *rev.*, 606.
Florence Past and Present (Brown), 223; *rev.*, 323.
—— Trade and Commerce of, 168, 560.
Folklore, Specimens of Bushman (Bleek), 609.
Foochow, Trade of, 448.
Foreign Import Duties, 56.
Forest Products of British West Africa, The Agricultural and (Dudgeon), 609.
Formosa, Trade of the Island of, 560.
Foster, John, Ayrshire (Cambridge County Geographies), 55.
France by River and Mead and Town, Unfrequented (Betham-Edwards), *rev.*, 103.
—— Distribution of the Vine in, 430.
—— Map of Belgium and the North-east of, *rev.*, 391.
—— Standard Time in, 204.
Fraser, Lovat, India under Curzon and After, 610.
—— Sir Andrew H. L., Among Indian Rajahs and Ryots, 168; *rev.*, 327.
French Antarctic Expedition, The Second. By Dr. J. B. Charcot, 113.
—— —— —— Results of, 38.
—— Budget for 1911, 667.
—— Chateaux, From Irish Castles to (Gostling), *rev.*, 156.

French Chateaux, Rambles Around (Gostling), 558.
—— Societies of Geography, National Congress of, 208.
—— **Upland Region, Life in a, 532.**
Friedrich, Dr. Ernst, Einfuhrung in die Wirtschaftsgeographie, 389.
Furness, William H., The Island of Stone Money: Uap of the Carolines, *rev.*, 51.
Fyfe, H. Hamilton, South Africa To-Day, with an Account of Modern Rhodesia, 609.

Gairloch, Ordnance Survey of, *rev.*, 109.
Galapagos Islands, 547, 602.
Galicia, Trade of, 390.
Galloway, A Nook in (Newbigging), 335; *rev.*, 551.
Galveston, Trade of District of, 560.
Gambia, Report for, 448.
Gando, Map of, 279.
Gannett, H., Relief Map of the United States, 279.
Garleton Hills, The Glaciation of East Lothian South of the (Kendall), 559.
Garstang, John, Meroe, the City of the Ethiopians, 389.
Gascoyne Cecil, Rev. Lord Wm., Changing China, 276; *rev.*, 492.
Gashegent, Map of, 279.
Gautier, E. F., La Conquête du Sahara, *rev.*, 161.
Geddie, John, Romantic Edinburgh, 559.
Geidam, Map of, 279.
Geikie, Prof. J., Presentation of Portrait, 601, 656.
—— James, Structural and Field Geology for Students of Pure and Applied Science, 224.
—— **Prof. Jas., LL.D., D.C.L., F.R.S., The Architecture and Origin of the Alps, 393.**
Geil, William Edgar, Eighteen Capitals of China, 611.
Genoa, Trade of, 390.
Geografica Muto, Atlante, *rev.*, 280.
Geographers, Association of American, 265.
Geographic Environment on the Basis of Ratzel's System of Anthropo-Geography, Influences of (Semple), 609.
Geographic Instruction, Purposes of, Prof. Rollin D. Salisbury on, 265.
Geografica. Bibliotheca (Baschin), 559.
Geographical Books and Appliances, Guide to (Herbertson), *rev.*, 43.
—— Congress, Tenth International, 147, 208, 265, 488, 603.
—— Diagrams and Land Forms, with Questions, Statistics, and Tables: The British Isles (Snape), 224; *rev.*, 321.
—— Essays (Davis), 224; *rev.*, 266.
—— Journal for Teachers, German, 662.
—— **Notes, 37, 94, 148, 203, 263, 310, 377, 430, 481, 546, 601, 659.**
—— Pictures (Black's), 55, 102.
Geographical Pictures, Philip's (L'Estrange), 389; *rev.*, 381.
—— Teaching in German Schools, 551.
Geographisches Jahrbuch, 1911, 612.
Geography, A Class-book of Practical (Young), 610.
—— A First Book of Physical (Carey), *rev.*, 223.
—— A Handbook of (Herbertson), 389.
—— A Scientific: Europe (Heaton), 276.
—— Class-book of Practical (Young and Fairgrieve), *rev.*, 662.
—— Commercial (Brigham), 559.
—— —— (Robinson), 56; *rev.*, 501.
—— Elementary Regional (Mort), 108; *rev.*, 330.
—— for Intermediate Classes, A Regional (Mort), 108; *rev.*, 330.
—— for Schools, Physical (Smith), 108; *rev.*, 222.
—— General and Regional (Unstead and Taylor), *rev.*, 331.
—— Highroads of (Nelson), 276, 389; *rev.*, 500.
—— International Congress of, 147, 208, 265, 488, 603.
—— Junior Scientific (Heaton), 167, 388.
—— Modern (Newbigin), 275; *rev.*, 445.
—— Modes of Life in Human, 486.
—— National Congress of French Societies of, 208.
—— of the British Colonies, A Historical (Rogers), 447.
—— Physical and Commercial (Gregory, Keller, Bishop), *rev.*, 165.
— Report of a Conference on the Teaching of, 277; *rev.*, 317.
—— Report on the Ninth International Congress of, 154.
—— **Some Recent Contributions to. By Geo. G. Chisholm, M.A., B.Sc., 561.**
—— Teaching of, Mr. D. W. Johnston on the, 101.
—— —— Prof. Salisbury on the, 100.
—— The Nations of the Modern World: an Elementary Study in (Mackinder), 167.
—— The New Outlook (Brown and Johnson), 334; *rev.*, 445.
—— **The Purpose and Position of. By Colonel C. F. Close, C.M.G., R.E., 505.**
—— The World: General Mathematical, Physical, and Economic Geography, Questions and Exercises in (Finch), 609.
—— Prof. Salisbury on the teaching of, 100.
Geologic Atlas, United States, *rev.*, 112.
—— History with Especial Reference to North America, Outlines of (Salisbury), *rev.*, 52.
Geological Subjects, Catalogue of Photographs of, 167; *rev.*, 208.
—— Survey of Scotland, 110, 278, 391, 503, 614.
Géologie, Traité de (Haug), *rev.*, 55.

Geology and Physics of Greenland and the Neighbouring Regions, Manual of the Natural History (Jones), 108.
—— Economic (Ries), *rev.*, 55.
—— for Students of Pure and Applied Science, Structural and Field (Geikie), 224.
—— of East Lothian, including Parts of the Counties of Edinburgh and Berwick, The (Clough), 109.
—— of Glenelg, Lochalsh, and South-East Part of Skye, The (Peach), 109.
—— of the Neighbourhood of Edinburgh (Peach), The, 109.
German Antarctic Expedition, Lieut. Filchner's, 99, 314, 485, 661.
—— Empire, Report on Finances of the, 277.
—— Schools, Geographical Teaching in, 551.
Germany, Trade of, 277.
Gibb, J. Taylor, The Land of Burns: Mauchline Town and District, 275; *rev.*, 551.
Gibraltar, Report for, 448.
Giles, Herbert A., The Civilisation of China, 667.
Gilgit, Hunza, the Pamirs, Chinese Turkestan, Mongolia, and Siberia. Across the Roof of the World: A Record of Sport and Travel through Kashmir (Etherton), 168.
Glaciers, Characteristics of Existing (Hobbs), 388; *rev.*, 556.
Glacial Erosion, 602.
Glasgow District, The Geology of the (Clough, Hinxman, etc.), 612.
—— Some Sylvan Scenes near (Brotchie), *rev.*, 157,
Glenelg, Lochalsh, and South-East Part of Skye, the Geology of (Peach), 109; *rev.*, 110.
Glenn, L. C., On Erosion in the Southern Appalachian Region, 474.
Goa, Trade of, 277.
Goat Fell Mountain Group, The Sculpture of the. By Frederick Mort, M.A., B.Sc., F.G.S., 632.
Goitre, The Distribution and Causation of, of, 41.
Gold and Silver Mining and Reduction Processes as Responses to Geographic Conditions. By George D. Hubbard, 417, 470.
—— Coast, Report for, 613.
—— —— Report on Forests of the, 448.
—— —— Report on Northern Territories of the, 560.
Gomes, Edwin H., Seventeen Years among the Sea Dyaks of Borneo, 168; *rev.*, 328.
Goodfellow, Mr. Walter, Expedition to Dutch New Guinea, 206.
Gorakhpur, Gazetteer of, 336.
Gosling, W. G., Labrador: Its Discovery, Exploration, and Development, *rev.*, 163.
Gostling, Francis M., Rambles around French Chateaux, 558.
Gothenburg, Trade and Commerce of, The, 613.
Gould, Marshall N., Spindrift and Sand-Drift: being a Trip to South Africa, 275: *rev.*, 442.
Graham, Stephen, Undiscovered Russia, 611.
Grande, Julian, The Bernese Oberland in Summer and Winter, 167; *rev.*, 325.
Gravesande, Storm Van's, The Rise of British Guiana, *rev.*, 370.
Greece: Ellsworth Huntington on the Causation of the Decay of Greece, 94.
—— Prof. J. L. Myres on the Inhabitants of, *rev.*, 203.
Greenland and the Neighbouring Regions, Manual of the Natural History, Geology, and Physics of (Jones), 108.
Gregory, Herbert E., Physical and Commercial Geography, *rev.*, 165.
Gregory, Prof. J. W., F.R.S., D.Sc., Constructive Waterfalls, 520, 537.
Grenfell, Dr. Wilfred, awarded the Murchison Bequest, 265.
Grieben's Belgium, *rev.*, 438.
—— Dolomites, 335; *rev.*, 438.
—— Munich, *rev.*, 438.
—— Riviera, 55; *rev.*, 438.
Griffith, F. Ll., Meroe, the City of the Ethiopians, 389.
Grimshaw, Percy H., A New Atlas of Zoogeography, 200; *rev.*, 280.
Grodno, Trade and Agriculture of, 667.
Gronland, West, Bei den Eskimos in (Trebitsch), *rev.*, 221.
Grubb, W. B., An Unknown People in an Unknown Land, 167; *rev.*, 386.
Guatemala, Trade of, 277.
Gubio, Map of, 279.
Guggesberg, Major F. G., Handbook of the Southern Nigeria Survey, and Text-Book of Topographical Surveying in Tropical Africa, 611.
Guiana, British, Report for, 168.
—— The Rise of British (Storm Van's Gravesande), 108; *rev.*, 370.
—— Wilds, Under the Roof of the Jungle: A Book of Animal Life in the (Bull), 611.
Guinea, Dutch New, Mr. Walter Goodfellow's Expedition to, 206.
Gumel, Map of, 279.

Habsburg Monarchy, The Southern Slav Question and the (Seton-Watson), 612.
Haddington District, Geological Survey of, *rev.*, 110.
Haddon, A. C., The Wanderings of Peoples, 610.
Hakodate, Trade of, 390.
Hall, Hammond, Hazell's *Annual*, 107; *rev.*, 166.
—— R. N., Rhodesia Museum, Bulawayo: Ethnological Section, 560.

Hamburg, Trade of, 613.
Hangchow, Trade of, 448.
Hankow, Trade of, 448.
Hann, Dr. Julius, Handbuch der Klimatologie, 447.
Hare, Augustus J. C., Cities of Southern Italy, 224 ; *rev.*, 324.
Hare Island, Flora of, 602.
Harford, Charles, Hints on Outfit for Travellers in Tropical Countries, 276.
Harris, C. A., Storm Van's Gravesande: The Rise of British Guiana, 108.
—— Mary D., The Story of Coventry, 609.
—— R. S., on the Distribution of Land in Arctic Regions, 433.
Harrison, J. B., on the Causes of the Formation of Laterite, 434.
Hartley, C. G., Things Seen in Spain, *rev.*, 45.
Hasluck, F. W., Cyzicus, 55 ; *rev.*, 214.
Haug, Émile, Traité de Géologie, *rev.*, 55.
Hausaland to Egypt, From. By Dr. Karl W. Kumm, 225.
—— —— —— Through the Sudan, From (Kumm), 107 ; *rev.*, 218.
Haute-Tatra, Les Chemins de Fer Kassa-Oderberg et la (Compton), 448 ; *rev.*, 551.
Havre, Trade of, 390.
Hawaii, Trade and Commerce of, 56.
Hawker, G., An Englishwoman's Twenty-Five Years in Tropical Africa, 335 ; *rev.*, 554.
Hayti, Report on, 437.
—— Trade of, 336.
Hazell's *Annual* (Hall), 107 ; *rev.*, 66.
Heath, Sidney, The South Devon and Dorset Coast, *rev.*, 103.
Heaton, Ellis W., Europe: a Scientific Geography, 276.
—— —— The British Empire, 447.
—— —— The Junior Scientific Geography, 167, 388.
—— —— The Mediterranean, 558.
Heaton's Commercial Handbook of Canada and Boards of Trade Register, 167 ; *rev.*, 220.
Hebrides, Colonsay : one of the (M'Neil), *rev.*, 210.
—— North Uist : Its Archæology and Topography, with Notes upon the Early History of the Outer (Beveridge), 612.
Hedin, Sven, Overland to India, 56 ; *rev.*, 71.
Hell, Dr. J., Die Kultur der Araber, *rev.*, 444
Hellas, Home Life in (Ferriman), *rev.*, 157.
Henkel, F. W., Weather Science, 558.
Henrici, Capt. E. O., on Mean Sea-level, 518.
—— —— on the Height of Ruwenzori, 518.
Herbert, Agnes, Casuals in the Caucasus, 618.
Herbertson, Dr. A. J., A Handbook of Geography, 389.
—— —— Guide to Geographical Books and Appliances, *rev.*, 43.
—— —— on Thermal Maps, 517.
Highland and Agricultural Society of Scotland, Trans. of the, 336.
—— **District of Appin on Tayside, Notes on Changes in the. By John Stewart, Jr., 281, 359.**
Hills and how Ronald read them, Secrets of the (Craig), 611.
Hilton-Simpson, M. W., Land and Peoples of the Kasai, 666.
Himalaya: Jottings of a Sportsman-Naturalist, Stalks in the (Stebbing), 611.
Hinks, A. R., on Representation of Hill Features, 517.
Hinxman, L. W., The Geology of the Glasgow District, 612.
Hispar, The Call of the Snowy (Workman), 56 ; *rev.*, 159.
Historical Atlas (Johnston), *rev.*, 112.
—— —— for Students, Philip's New, *rev.*, 616.
—— Wall Maps of Scotland (Johnston), *rev.*, 110.
Hitchens, Robert, The Holy Land, *rev.*, 269.
Hobbs, William Herbert, Characteristics of Existing Glaciers, 388 ; *rev.*, 556.
Hobley, C. W., Ethnology of A-Kamba and other East African Tribes, 55 ; *rev.*, 271.
Hochberg, Count Fritz von, An Eastern Voyage: A Journal of Travels through the British Empire in the East and South, and Japan, 224 ; *rev.*, 273.
Hodeidah, Trade and Commerce of, 109.
Hodge, F. W., Handbook of American Indians, 277.
Hodgson, F. C., Venice in the Thirteenth and Fourteenth Centuries, *rev.*, 212.
Hodson, T. C., The Naga Tribes of Manipur, 275 ; *rev.*, 385.
Hoffmeister, E. V., Durch Armenien, eine Wanderung und der Zug Xenophon's bis zum Schwarzen-Meere, 611.
Holder, Charles F., The Channel Islands of California, *rev.*, 164.
Holy Land, The (Hitchens), *rev.*, 269.
Homan's Solar Chronometer, 91.
Honduras, British, Report on the Surveys of, 613.
—— —— Report for, 168.
Hong-Kong, Report of, 56, 667.
Hongrie Pittoresque, Voyage en Automobile dans la (Marge), *rev.*, 209.
Howarth, O. J. R., A Geography of Ireland, 335 ; *rev.*, 606.
Huascaran, Détermination de l'Altitude du Mont (Bullock-Workman), 276 ; *rev.*, 484.
Hubbard, George D., Gold and Silver Mining and Reduction Processes as Responses to Geographic Conditions, 417, 470.

Hubert, H., on Geophagy in the Sudan, 483.
Hudson Strait on Board the D.G.S. *Arctic*, Report on the Dominion of Canada Government Expedition to the Arctic Islands and (Bernier), 447.
Hume, James, Syllabus of the Geographical Section of the Philosophical Society of Glasgow, 44.
—— Dr. W. F., on the Glacial Period and Climatic Changes in North-Eastern Africa, 530.
Humphreys, Prof. J. W., on the Earth as a Radiator, 530.
Hungary (Kain), *rev.*, 104.
—— A Study of Electoral Practice, Corruption and Reform in (Seton-Watson), 167 ; *rev.*, 210.
—— Trade and Commerce of, 390.
Hunstanton, The Rocks of (Jackson), 277.
Hunter, Dr. J. E., Diploma of Fellowship conferred on, 429.
Hunting Camps in Wood and Wilderness (Prichard), *rev.*, 54.
Huntington, E., on the Causation of the Decay of Greece, 94.
—— —— on the Oasis of Kharga and Climatic Variation, 97.
—— —— Palestine and its Transformation, *rev.*, 334.
Hunza, the Pamirs, Chinese Turkestan, Mongolia, and Siberia. Across the Roof of the World: A Record of Sport and Travel through Kashmir, Gilgit (Etherton), 168.
Hutchinson, Horace G., A Saga of the *Sunbeam*, 223 ; *rev.*, 330.
Hyam, J. C., Biskra, A Practical Handbook for Travellers, *rev.*, 329.
Hyatt, Stanley Portal, Off the Main Track, 558 ; *rev.*, 665.
Hydrography, Inter. Review of Hydrobiology and, 487.

Iceland, Trade of, 560.
Imperial Institute, Report on the work of the, 613.
India, A Dictionary of the Pathan Tribes on the North-West Frontier of, 56.
—— Administration Report of the Marine Survey of, 56.
—— and Adjacent Countries, Map of, *rev.*, 615.
—— East, Statement exhibiting the Moral and Material Progress and Condition of, 448.
—— Index Maps to Degree and Standard Sheets of, 279.
—— Jungle By-ways in (Stebbing), *rev.*, 45.
—— Levelling of Precision in (Burrard), 667.
—— Overland to, 71.
—— Overland to (Hedin), 56 ; *rev.*, 71.
—— Railway and Canal Map of, *rev.*, 615.
—— Rainfall of, 559.
—— Report of the Trade of, 168.
India, Report on the Operations of the Survey of, 224, 612.
—— Report on the Railways in, 559.
—— Things Seen in Northern (Pennell), 666.
—— Trade of, 605.
—— under Curzon and After (Fraser), 610.
—— United Provinces, Map of, *rev.*, 615.
—— with Respect to the World's Cotton Supply, 531.
Indian Atlas, Index to the, 279.
—— Rajahs and Ryots, Among (Fraser), 168 ; *rev.*, 327.
—— Tea Districts, Taylor's Maps of the, *rev.*, 111.
Indian Trails : Incidents of Camp and Trail Life, covering Two Years' Explorations through the Rocky Mountains of Canada, Old (Schaffer), 610.
Indians, Handbook of American (Hodge), 277.
Indo-Chine, Map of (Saint-Martin), *rev.*, 392, 615.
—— —— Française, L' (Russier and Brenier), 335 ; *rev.*, 441.
International Geographical Congress, Report on the Ninth, 154.
—— —— —— The Tenth, 147, 208, 265, 603.
—— Polar Commission, Appointment of Delegates, 147.
Inverbroom, Ordnance Survey of, *rev.*, 109.
Iquique, Trade of, 560.
Iquitos, Trade of, 336.
Ireland, A Geography of (Howarth), 335 ; *rev.*, 606.
—— An Englishman in (Scott-James), *rev.*, 267.
—— Census of, 390.
—— Impressions of a Journey in a Canoe by River, Lough, and Canal : An Englishman in (Scott-James), 224.
Irish Castles to French Chateaux, From (Carson), *rev.*, 156.
Iron and Steel, Board of Trade Reports, 109.
Isa, Map of, 279.
Islam in China (Broomhall), 55 ; *rev.*, 157.
—— Lands (Shoemaker), 56 ; *rev.*, 162.
Isle of Wight with the Mainland, Former Connection of the, 519.
Italia, Carta Fisico-Politica Regno D', *rev.*, 391.
—— Carta Politica Regno D', *rev.*, 391.
Italian Year, My (Bagot), 610.
Italy and Sicily, Guide to (Macmillan), 108 ; *rev.*, 268.
—— Cathedral Cities of (Collins), 610.
—— Cities of Southern (Hare), 224 ; *rev.*, 324.
—— Condition of Southern, 311.
—— Finances of, 613.
—— Foreign Trade of, 109.
—— Little Cities of (Maurel), 610.

Jack, Capt., on the Height of Ruwenzori, 518.
Jackson, J. F., The Rocks of Hunstanton, 277.
Jamaica, Flora of (Fawcett), 611.
—— Report on the Surveys of, 613.
—— Report on Trade of, 109.
Japan. An Eastern Voyage: A Journal of Travels through the British Empire in the East and South, and Japan (Hochberg), 224; *rev.*, 273.
—— Commerce of, 379.
—— Mining in, *rev.*, 214.
—— Rare Days in (Ladd), *rev.*, 105.
Japan, The Highways and Homes of, 55, 260.
—— Trade of, 560.
Japaner, Deutsche Grammatik fur (Seidel), 611.
Japanese Antarctic Expedition, 151, 314.
—— Budget, Report on the, 448.
—— Empire, Topographical Map of, *rev.*, 615.
Japanischen Umgangssprache Wörterbuch der Deutsch- (Seidel), 447.
Japon, Résumé Statistique de l'Empire du, 109.
Java, Sumatra, and the other Islands of the Dutch East Indies (Cabaton), 609.
—— Trade of, 390.
Jefferson, Prof. Mark, on Rocky Mountain Forms, 265.
Jeffrey, H. J., British Plants, 558; *rev.*, 608.
Jenness, D., Expedition to New Guinea, 548.
Jerusalem, Trade of, 448.
Jhang, Punjab District Gazetteers, 108.
Jhansi, Gazetteer of, 336.
Johnson, P. H., The New Outlook Geography, 334; *rev.*, 445.
Johnston, Mr. D. W., on the Teaching of Geography, 101.
—— P. H., The Home of Man, 276; *rev.*, 445.
—— Sir H. H., The Opening up of Africa, 447; *rev.*, 607.
—— W. and A. K., loan of model of Island of Bute, 380.
Johnston's Bathy-Orographical Map of England, *rev.*, 614.
—— Bathy-Orographical Map of Europe, *rev.*, 391.
—— Bathy-Geographical Map of the World, *rev.*, 112.
—— Historical Atlas, *rev.*, 112.
—— Historical Wall Maps of Scotland, *rev.*, 110.
—— Scholar's Geographical Exercise Book, *rev.*, 605, 616.
—— "Three Miles to Inch" Map of Scotland, *rev.*, 391, 503.
Jones, Prof. T. Rupert, Manual of the Natural History, Geology, and Physics of Greenland and the Neighbouring Regions, 108.
Joyce, T. A., Notes Ethno. sur les peuples communément appelés Bakuba, 336.
Jukes-Browne, A. J., The Building of the British Isles, 108; *rev.*, 211.
Jungle: A Book of Animal Life in the Guiana Wilds. Under the Roof of the (Bull), 611.

Kacharis, The (Endle), 558; *rev.*, 663.
Kain, Albert, Hungary, *rev.*, 104.
—— Trade of, 613.
Kamerun, German, Territorial Changes in the, 659.
—— Karte von (Moisel), *rev.*, 111, 392, 615.
Kano, Map of, 279.
Kasai, Land and Peoples of the (Hilton-Simpson), 666.
Kashmir, Gilgit, Hunza, the Pamirs, Chinese Turkestan, Mongolia, and Siberia. Across the Roof of the World: A Record of Sport and Travel through (Etherton), 168.
Kassa-Oderberg et la Haute-Tatra, Les Chemins de Fer (Compton), 448; *rev.*, 551.
Katagum, Map of, 279.
Katanga, Carte du district du, *rev.*, 392.
Katsina, Map of, 279.
Kaura, Map of, 279.
Keller, Albert G., Physical and Commercial Geography, *rev.*, 165.
Keltie, J. Scott, The Statesman's Year-Book, 447; *rev.*, 500.
Kemp, E. G., The Face of Manchuria, Korea, and Russian Turkestan, *rev.*, 160.
Kendall, Professor P. F., and Mr. E. B. Bailey, The Glaciation of East Lothian South of the Garleton Hills, 559.
Kennard, H. P., Russian Year-Book, 276.
Kent Coast, The (Lewis), 448; *rev.*, 553.
Kermanshah, Trade of, 560.
Kernan, Trade of, 448.
Khara and Climatic Variation, Mr. Ellsworth Huntington on the Oasis of, 97.
Kharsawan, Bengal District Gazetteers (O'Malley), 108.
Khorasan, Trade of, 109, 613.
Kiaochow, Trade of, 448.
Kientchang et Lolotie, Le Far-West Chinois (Legendre), *rev.*, 213.
Kingsley, Rose G., In the Rhone Country, *rev.*, 156.
Kirjali, Map of, 279.
Kiukiang, Trade of, 448.
Kiungchow, Trade of, 560.
Klimatologie, Handbuch der (Hann), 447.
Knox, Alexander, The Climate of the Continent of Africa, 667.
Knox's Ceylon, 479.
Knox, Robert, An Historical Relation of Ceylon, 335; *rev.*, 479.
Kobe, Trade and Navigation of, 613.
Koebel, W. H., Uruguay, 389; *rev.*, 498.

Konody, P. G., Through the Alps to the Apennines, 336; *rev.*, 492.
Korea and Russian Turkestan, The Face of Manchuria (Kemp), *rev.*, 160.
—— The Story of (Longford), 558; *rev.*, 607.
Kozloff, Colonel P. K., awarded the Founder's Medal, 265.
Krümmel, Dr. Otto, Handbuch der Ozeanographie, 224; *rev.*, 444.
Kukawa, Map of, 279.
Kumm, Dr. Karl W., From Hausaland to Egypt, 225.
—— H. Karl W., From Hausaland to Egypt through the Sudan, 107; *rev.*, 218.
—— Dr. H. Karl W., Lecture by, 37.

Labrador: Its Discovery, Exploration, and Development (Gosling), *rev.*, 163.
—— Through Trackless (Prichard), 666.
Ladd, George, Rare Days in Japan, *rev.*, 105.
Lagos, Harbour work at, 548.
—— Survey of, referred to, 35.
Lahore, Punjab District Gazetteers, 108.
Lakes, By Fell and Dale at the English (Rawnsley), 335; *rev.*, 491.
Lallemand, Ch., on International Air Maps, 528.
Lamplugh, Mr. G. W., Report on Geological Congress' Excursion to Spitsbergen, 98.
Lanarkshire, Ordnance Survey of, *rev.*, 110.
Land Forms, with Questions, Statistics, and Tables. The British Isles, Geographical Diagrams and (Snape), 224; *rev.*, 521.
Lands of the West, The (Cross), 610.
—— and their Stories: Europe and its Peoples (Palmer), *rev.*, 267.
Laos, Le (Reinach), 447; *rev.*, 664.
Lapland, A Visit to, A. L. Cross, 78.
Larden, W., Argentine Plains and Andine Glaciers, 335; *rev.*, 497.
Larpent, G. de H., Lecture by, 655.
Laterite, Causes of the Formation of, 434.
Laughton, A. M., Victorian Year Book, 277.
Laws, Revision of, 429.
Lawson, Lady, Highways and Homes of Japan, 55.
Lebeau, Henri, Otahiti: au pays de l'éternel Été, 168; *rev.*, 271.
Lecce, Trade of, 613.
Leeward Islands, Report for, 277.
Legendre, A.-F., Le Far-West Chinois, Kientchang et Lolotie, *rev.*, 213.
Leghorn, Trade of, 613.
Leipzig, Trade of, 613.
—— University, Geographical Society founded in connection with, 605.
Lemoine, P., on the Causes of the Formation of Laerite, 434.
Lengua Indians of the Paraguayan Chaco. An Unknown People in an Unknown Land: An Account of the Life and Customs of the (Grubb), 167; *rev.*, 386.
Lennie, Alice B., M.A., B.Sc., Geographical Description of the County of Sutherland, 18, 128, 188.
Leon, Trade of, 390.
L'Estrange, P. H. L., Philip's Geographical Pictures, 389; *rev.*, 391.
Lewin, W. Henry, Did Peary reach the Pole? 447; *rev.*, 500.
Lewis, Arthur D., The Kent Coast, 448; *rev.*, 553.
Liberia, Trade of, 390.
—— im Winter 1906-1907, Reise durch das Hinterland von (Volz), 275.
Lima by way of Potosi, Across South America: An Account of a Journey from Buenos Aires to (Bingham), 609.
Limousin, Characteristics of the Inhabitants of, 532.
Linlithgow Palace: Its History and Traditions (Ferguson), *rev.*, 155.
Lisbon, Trade of, 448.
Livingstone Centenary, Captain L. Bruce appointed Delegate, 655.
Lloyd, L. C., Specimens of Bushman Folklore (W. H. I. Bleek), 609.
Lochalsh, and South-East Part of Skye. The Geology of Glenelg (Peach), 109.
Loetschberg Tunnel, The New, 266, 549.
Loire, La Haute (Boule), 335; *rev.*, 491.
Lolotie, Le Far-West Chinois, Kientchang et (Legendre), *rev.*, 213.
Lombardy, Trade of, 560.
London County Council, Report of a Conference on the Teaching of Geography, *rev.*, 317.
London District, Quarter-inch to Mile Map of (Bartholomew), *rev.*, 503.
Longe, Colonel F. B., General Report on the Operations of the Survey of India, 224.
Longford, Joseph H., The Story of Korea, 558; *rev.*, 607.
Lorentz, H. A., LL.D., An Expedition to the Snow Mountains of New Guinea, 337.
—— —— Lecture by, 93.
Lothian, including Parts of the Counties of Edinburgh and Berwick. The Geology of East (Clough), 109.
—— South of the Garleton Hills, The Glaciation of East (Kendall), 559.
Lowe, Percy R., A Naturalist on Desert Islands, 666.
Lyell, D. D., Hunting Trips in Northern Rhodesia, *rev.*, 47.
Lyons, Captain H. G., awarded the Victoria Research Medal, 265.
—— —— Lecture by, 147.
—— —— On Aeronautical Maps, 528.
—— —— **D.Sc., F.R.S., The Valley of the Nile, 257.**
Lyons, Trade of, 448.

M'Clintock, Walter, The Old North Trail; or, Life, Legends, and Religion of the Blackfeet Indans, *rev.*, 49.

Macdonald, George, The Roman Wall in Scotland, 275; *rev.*, 382.
Macgill, W., Old Ross-shire and Scotland as seen in the Tain and Balnagown Documents, 277.
Machinna, Map of, 279.
Mackenzie, Donald, The Khalifate of the West, being a General Description of Morocco, 167; *rev.*, 329.
Mackie, Alexander, Aberdeenshire, 389.
Mackinder, H. J., The Nations of the Modern World, 167; *rev.*, 274.
Maclean, Rev. D., Travels in Sunny Lands, 389; *rev.*, 501.
Macmillan's Guide to Italy and Sicily, 108; *rev.*, 278.
—— —— to Palestine and Syria, 167; *rev.*, 278.
—— Orographical Map of Europe (Andrews and Dickinson), 277; *rev.*, 267.
Macmunn, Miss, Guide to Geographical Books and Appliances, *rev.*, 43.
M'Neil, Murdoch, Colonsay: One of the Hebrides, *rev.*, 210.
Madagascar et Dependances, Guide-Annuaire de, 448.
—— Trade of, 448, 489.
Madeira, the Canary Islands, etc., The Mediterranean (Baedeker), 276; *rev.*, 446.
—— Trade of, 448.
Maeso, Carlos M., El Uruguay, 448.
Magellan, Early Spanish Voyages to the Strait of (Markham), 558.
Malaga, Trade of the District of, 613.
Malta, Report for, 613.
Man, Distribution of Plants and of, 39.
—— The Home of (Brown and Johnston), 276; *rev.*, 445.
Manaos, A Journey Across South America from Bogota to: Lecture by Dr. Hamilton Rice, 93.
Manga, Map of, 279.
Mangea, Map of, 279.
Manipur, The Naga Tribes of (Hodson), 275; *rev.*, 385.
Maps, Aeronautical, 528.
—— **and Atlases, New, 109, 277, 502, 613.**
—— Bacon's Contour Hand-, *rev.*, 391.
—— Drawing of Memory, 44.
—— for Class Teaching, How to use Contour Hand- (White), 335; *rev.*, 558.
—— Ch. Lallemand on International Air, 527.
—— Philip's Contour Outline, *rev.*, 209.
—— Professor A. J. Herbertson on Thermal, 517.
—— Visual Series of Outline (Philip's), *rev.*, 504.
Maradi, Map of, 279.
Marcks, A. F., Carte de Russie d'Europe, *rev.*, 278.
Marge, Pierre, Voyage en Automobile dans la Hongrie Pittoresque, *rev.*, 209.
Maritime Alps, Mr. L. F., Tessier on Distribution of Forest Trees in the, 148.
Markham, Sir Clements, Early Spanish Voyages to the Strait of Magellan, 558.
—— —— The Incas of Peru, *rev.*, 220.
Marquesas Islands, Eastern Pacific Lands, Tahiti and the (Christian), *rev.*, 164.
Marriott, W., Hints to Meteorological Observers, 334.
Marseilles, Trade of the District of, 560.
Martin, Professor L., appointed to study the Glaciers of Alaska, 314.
Martinique, Trade of, 109.
Martonne, Professor E. de, on Coast Erosion, 154.
—— —— on Glacial Erosion, 603.
—— —— on the Evolution of the Relief of Central Asia, 312.
Maryland, the Vegetation of, 1.
Masaka, Map of, *rev.*, 615.
Masindi Port, Map of, *rev.*, 615.
Matankari, Map of, 279.
Matterhorn, A Guide to Zermatt and the (Whymper), 559; *rev.*, 491.
Mauchline, Town and District, The Land of Burns (Gibb), 275; *rev.*, 551.
Mauritius, Report for, 168.
Maurel, Andre, Little Cities of Italy, 610.
Mawson, Dr., Antarctic Expedition, 100, 264, 378.
Maxwell, Sir Herbert, The Making of Scotland, 276; *rev.*, 382.
Mecklenburg, Duke Adolphus Frederick of, In the Heart of Africa, *rev.*, 48.
Mediterranean Region, Europe and the (Reynolds), 334; *rev.*, 489.
—— The (Heaton), 558.
—— Cruise, The (Millard), 168; *rev.*, 268.
—— The, Seaports and Sea Routes, including Madeira, the Canary Islands, etc. (Baedeker), 276; *rev.*, 446.
Melanesians and Polynesians (Brown), *rev.*, 51.
Melrose, A Roman Frontier Post and its People: The Fort of Newstead in the Parish of (Curle), 108; *rev.*, 213.
Memory Maps, Drawing of, 44.
Mengtsz, Trade of, 560.
Mentone and its Neighbourhood: The Past and Present (Muller), 55; *rev.*, 104.
Meroe, the City of the Ethiopians (Garstang), 389.
Mesopotamia, Map of Lower, *rev.*, 615.
Meteorological Observers, Hints to (Marriott), 334.
Meuriet, A., Carte de la Côte Française des Somalis, *rev.*, 504.
Mexico: A General Sketch (Barrett), 558.
Mexico, Fifteen Thousand Miles by Stage (Strahorn), 666.
—— Trade of, 560.
Midnapore, District Gazetteer of, 613.

Midnight Sun, Mountaineering in the Land of the (Aubrey Le Blond), *rev.*, 212.
Mieville, Sir Walter F., Letters from Norway, 667.
Milan on Foot, Paris to: The Chronicle of a Pilgrimage (Monro), *rev.*, 45.
Military Terms, English and Italian (Caiani), 276.
Mill, Hugh Robert, British Rainfall, 1910, 559.
—— —— The Realm of Nature: An Outline of Physiography, 612.
Millard, Bruce, The Mediterranean Cruise, 168; *rev.*, 268.
Milne, Mrs. L., Shans at Home, 335; *rev.*, 325.
Minerals and Mining, Papers and Reports Relating to, 109.
Mining, Papers and Reports Relating to Minerals and, 109.
Missouri to the Pacific, Fifteen Thousand Miles by Stage (Strahorn), 666.
Moisel, Max, Karte von Kamerun, *rev.*, 111; 392, 615.
Monaco and Oceanographical Research, The Prince of. By Wm. Bruce, LL.D., F.R.S.E., 142.
Monckton, H. W., Berkshire (Cambridge County Geographies), 275.
Mongolia, Mr. Carruthers' Expedition to North-West, 94.
Mongolia and Siberia, Across the Roof of the World: A Record of Sport and Travel through Kashmir, Gilgit, Hunza, the Pamirs, Chinese Turkestan (Etherton), 168.
Mongolie, Les Derniers Barbares, Chine, Tibet (D'Ollone), 275; *rev.*, 439.
Mont Blanc, A Guide to Chamonix and the Range of (Whymper), *rev.*, 491; 559.
Monro, Harold, The Chronicles of a Pilgrimage; Paris to Milan on Foot, *rev.*, 45.
Monroe, Will S., Bohemia and the Čechs, *rev.*, 157.
Montagu, G., on the Origin of English Highways, 310.
Moore, Sir Newton J., Lecture by, 601.
Moravia and Silesia, Bohemia and the Čechs (Monroe), *rev.*, 157.
Morea, Trade of, 390.
Morel, E. D., Nigeria: Its Peoples and its Problems, 666.
Morocco, Mysterious (Ward), *rev.*, 49.
—— The Coast of, The Mediterranean (Baedeker), 276; *rev.*, 446.
—— The Khalifate of the West, being a General Description of (Mackenzie), 167; *rev.*, 329.
Mort, Frederick, Elementary Regional Geography, 108; *rev.*, 330.
—— —— A Regional Geography for Intermediate Classes, 108; *rev.*, 330.
Mort, Frederick, M.A., B.Sc., F.G.S., The Sculpture of the Goat Fell Mountain Group, 632.
Moscow, Trade of, 448.
Moslem East, Life in the (Ponafidine), 610.
Mossman, R. C., on the Work of the Argentine Antarctic Station, 377.
Mothersole, Jessie, The Isles of Scilly, 55; *rev.*, 156.
Moule, A. E., Half-a-Century in China, 276; *rev.*, 385.
Mountaineering in the Land of the Midnight Sun (Aubrey Le Blond), *rev.*, 212.
Mubendi, Map of, *rev.*, 615.
Mulhall, M. M., Beginnings: or Glimpses of Vanished Civilisations, 335; *rev.*, 446.
Muller, Dr. G., Mentone and its Neighbourhood: The Past and Present, 55; *rev.*, 104.
Munich (Grieben), *rev.*, 438.
Murray, Hilda, Echoes of Sport, *rev.*, 52.
—— Sir J., Presentation of Agassiz Memorial Gold Medal, 485.
Muscat, Trade of, 109.
Muzaffargarh, Punjab District Gazetteers, 108.
Myingyan District, Map of, *rev.*, 615.
Myers, Professor J. L., on the Inhabitants of Greece, *rev.*, 203.

Nadia, District Gazetteer of, 336.
Naga Tribes of Manipur, The (Hodson), 275; *rev.*, 385.
Nagasaki, Trade of, 390.
Nanking, Trade of, 390.
Nan Shan and Port Arthur, My Experience at (Tretyakov), 611.
Nansen, Dr. Fridtjof, Lecture by, 601.
—— —— In Northern Mists: Arctic Exploration in Early Times, 666.
—— —— **The Norsemen in America, 617.**
Naples, Trade of, 448.
Naraguta, Map of, *rev.*, 615.
Nations of the Modern World, The (Mackinder), *rev.*, 274.
Nations, Ruling: Considerations on their Characters. By Victor Dingelstedt, 291.
—— —— Erratum, 429.
Naturalist on Desert Islands, A (Lowe), 666.
Nature: An Outline of Physiography, The Realm of (Mill), 612.
Neihardt, John G., The River and I, 55; *rev.*, 163.
Nelson's Highroads of Geography, 276, 389; *rev.*, 500.
Neve, Dr. Arthur, Awarded the Back Bequest, 265.
Nevill, H. R., District Gazetteer of Agra, 336, 613.
Newbiggin, T., A Nook in Galloway, 335; *rev.*, 551.

Newbigin, Dr. M. I., Modern Geography, 273; *rev.*, 445.
—— —— Referred to, 565.
Newchwang, Trade of, 560.
New Guinea, An Expedition to the Snow Mountains of. By H. A. Lorentz, LL.D., 337.
—— Lecture by Dr. H. A. Lorentz, 93.
—— D. Jenness' Expedition to, 547.
—— Capt. Rawling's Expedition to, 527.
New Jersey, Trade of, 560.
New Orleans, Trade of, 448.
New South Wales, Official Year Book, (Trivett), 667.
Newstead in the Parish of Melrose, A Roman Frontier Post and its People: The Fort of (Curle), 108; *rev.*, 213.
New York, Trade of, 560.
New Zealand (Stout), 610.
—— Report on the Dune-Areas of (Cockayne), 612.
Nice, Trade and Commerce of, 448.
Nigeria and its Tin Fields (Calvert), 108; *rev.*, 218.
—— Its Peoples and its Problems (Morel), 666.
—— Map of, Naraguta Sheet, *rev.*, 615.
—— or Life and Travel in the Central Sudan, On Horseback through (Falconer), 666.
—— Northern and Southern, Map of, *rev.*, 111.
—— Northern, General Staff Map of, *rev.*, 392.
—— —— Map of, 279.
—— —— Report for, 336.
—— —— Report on the Results of the Mineral Survey of, 667.
—— —— The Geology and Geography of (Falconer), 335; *rev.*, 554.
—— Southern, Central and Eastern Provinces of (Beverley), *rev.*, 35.
—— —— Report for, 168.
—— —— Report on the Results of the Mineral Survey of, 277, 667.
—— —— Structure of, 36.
—— —— Survey and Text-Book of Topographical Surveying in Tropical Africa, Handbook of the (Guggesberg), 611.
—— —— Survey of, referred to, 35.
—— —— **The Mineral Survey of, 34.**
Nigerian Studies: or the Religious and Political System of the Yoruba (Dennett), *rev.*, 162.
Nile, The Valley of the. By Captain H. G. Lyons, D.Sc., F.R.S., 147, 257.
Nilgiris and Wynaad, Sport on the (Fletcher), 612.
Nils, Das Abflussgebiet des (Pietsch), 109.
Nisbet, Thomas, M.A., The Plant-Geography of Ardgoil, 449.
Normandy and Brittany, Handbook for (Cook), *rev.*, 438.
Norsemen in America, The. By Dr. Fridtjof Nansen, G.C.V.O., 617.
North: The Story of Polar Exploration, The Great White (Wright), *rev.*, 221.
North Trail; or, Life, Legends, and Religion of the Blackfeet Indians, The Old (M'Clintock), *rev.*, 49.
Northern Mists: Arctic Exploration in Early Times, In (Nansen), 666.
Norton, A. P., A Star Atlas and Telescopic Handbook, *rev.*, 280.
Norway, Handbook to, 448; *rev.*, 551.
—— Letters from (Mieville), 667.
—— Trade of, 168, 390.
Notes, Geographical, 37, 94, 148, 203, 263, 310, 377, 430, 481, 546, 659.
Nova Scotia: The Province that has been passed by (Willson), 447; *rev.*, 556.
Nubia, the Sudan, Tunisia, and Algeria: Islam Lands (Shoemaker), 56.
Nyasaland, Report for, 667.
—— Report on the Results of the Mineral Survey, 667.

Obituary, 94.
Oceanographical Research, The Prince of Monaco and. By Wm. S. Bruce, LL.D., F.R.S.E., 142.
Odessa, Trade of, 613.
Ogilvie, Dr. F. Grant, appointed President of the Board of Education, 548.
Oil Industry, Report on the, 336.
Okey, Thomas, The Story of Avignon, 667.
Olive in the French Alps, The Northern Limit of the, 87.
Olufsen, Prof. O., The Emir of Bokhara and his Country: Journeys and Studies in Bokhara, 667.
O'Malley, L. S. S., Bengal District Gazetteers, 108.
Ontario, Topographical Map of, *rev.*, 111, 279, 392.
Oporto, Trade of, 336.
Orchid-gathering in the East: Pilgrims to the Isles of Penance (Clifton), 610.
Ordnance Survey Maps, Sale of, 662.
—— —— of Scotland, 109, 110, 277, 278, 391, 502, 613.
Orissa, Gazetteer of, 336.
Orléans, Duc D', Campagne Arctique de 1907, 447.
—— —— Chasses et Chasseurs Arctiques, 389.
Oronsay, with Part of the Ross of Mull, The Geology of Colonsay and (Craig, Wright and Bailey), 612.
Otahité: au Pays de l'éternel Été (Lebeau), 168; *rev.*, 271.
Oudh, District Gazetteers of Agra and, 108, 336, 613.
Outfit for Travellers in Tropical Countries, Hints on (Harford), 276.
Ozeanographie, Handbuch der (Krummel), 224; *rev.*, 444.

Pacific, Fifteen Thousand Miles by Stage, from the Missouri to the (Strahorn), 666.

Pacific Lands, Tahiti and the Marquesas Islands, Eastern (Christian), *rev.*, 164.
Pakhoi, Trade of, 448.
Palestine and its Transformation (Huntington), *rev.*, 334.
Palestine and Syria, Guide to (Macmillan's), 167; *rev.*, 268.
Palmer, H. W., Europe and its Peoples, 168.
—— —— Lands and their Stories: Europe and its Peoples, *rev.*, 267.
Palm-oil Industry, 603.
Pamirs, Chinese Turkestan, Mongolia, and Siberia. Across the Roof of the World: A Record of Sport and Travel through Kashmir, Gilgit, Hunza, the (Etherton), 168.
Panama and Adjacent Regions, Canal Projects in the Isthmus of. By H. J. Peddie, 13.
—— Canal Zone, Biological Survey of the, 98.
Panamakanal. Die Bedeutung des Kanalbaues, Der (Fiegel), 667.
Papua: A Handbook to its History (Pritchard), 388; *rev.*, 556.
—— An Outpost in (Chignell), 334; *rev.*, 498.
Paraguayan Chaco. An Unknown People in an Unknown Land: An Account of the Life and Customs of the Lengua Indians of the (Grubb), 167; *rev.*, 386.
Paris to Milan on Foot: The Chronicle of a Pilgrimage (Monro), *rev.*, 45.
Parkinson, J., on the Structure of Southern Nigeria, 36.
Pathan Tribes on the North-West Frontier of India, A Dictionary of the, 56.
Peach, Dr. B. N., Description of Arthur's Seat Volcano, 389; *rev.*, 491.
—— —— The Geology of Glenelg, Lochalsh, and South-East Part of Skye, 109.
—— —— The Geology of the Neighbourhood of Edinburgh, 109; *rev.*, 307.
Peary, A Tenderfoot with (Borup), 609.
—— reach the Pole? Did (Lewin), 447; *rev.*, 500.
Peddie, H. J., Canal Projects in the Isthmus of Panama and Adjacent Regions, 13.
Peerage, Baronetage, Knightage, and Companionage for the Year, Whitaker's, 107.
Penck, Professor, on New Classification of Climates, 152.
Pennel, T. L., Things seen in Northern India, 666.
Peoples, The Wanderings of (Haddon), 610.
Pernambuco, Trade of, 448.
Perou, Andes du, Détermination de L'Altitude du Mont Huascaran (Bullock-Workman), 276; *rev.*, 484.
Persia, Trade of, 613.
Persian Railway, The Proposed Trans-. By Lt.-Col. A. C. Yate, 169.
Peru, The Incas of (Markham), *rev.*, 220.
Petavel, Prof. J. E., on Aeronautical Maps, 528.
Petri, E., Carte de Russie d'Europe, *rev.*, 278.
Pettersson, Prof. O., on Tidal Movements in the Skagerrak, 520.
Philadelphia, Trade of, 448.
Philip's Contour Outline Maps, *rev.*, 209; 614.
—— Geographical Pictures (L'Estrange), 389; *rev.*, 581.
—— New Historical Atlas for Students, *rev.*, 616.
—— Visual Series of Outline Maps, *rev.*, 504.
Philippine Islands, Trade and Commerce of, 109.
Philippines, A Visit to the. By Mrs. Gabrielle Vassal, 57.
—— Volcanic eruption in the, 546.
Philosophical Society of Glasgow, Syllabus of the Geographical Section of the, 44.
Photographs of Geological Subjects, Catalogue of, *rev.*, 208.
Physical Geography for Schools (Smith), *rev.*, 222.
Physical and Commercial Geography (Gregory, Keller, Bishop), *rev.*, 165.
Physical Geography, A First Book of (Carey), *rev.*, 223.
Physiography (Salisbury), 168.
—— The Realm of Nature: An Outline of (Mill), 612.
Pietsch, Dr. Walter, Das Abflussgebiet des Nils, 109.
Pilgrimage, The Chronicle of a: Paris to Milan on Foot (Monro), *rev.*, 45.
—— The Glory of the Shia World: The Tale of a (Sykes), *rev.*, 106.
Piræus, Trade and Agriculture of, 560.
Plants and of Man, Distribution of, 39.
—— British (Bevis), 558; *rev.*, 608.
Plant-Geography of Ardgoil, The. By Thomas Nisbet, M.A., 449.
Poland, Trade and Agriculture of, 667.
Polar Commission, International, Appointment of Delegates, 147.
—— Exploration (Bruce), 275; *rev.*, 443.
—— —— The Great White North: the Story of (Wright), 56; *rev.*, 221.
Pole? Did Peary reach the (Lewin), 447; *rev.*, 500.
—— My Attainment of the (Cook), 609.
Polynesians, Melanesians and (Brown), *rev.*, 51.
Pomerania, Trade of, 560.
Ponafidine, P., Life in the Moslem East, 610.
Population, Scotland, 1911, Density of By Geo. G. Chisholm, M.A., B.Sc., 466.
Porsild, Prof. M. P., on the Flora of Hare Island, 602.
Port Arthur, My Experience at Nan Shan and (Tretyakov), 611.

Portland, Trade of, 560.
Portolan Charts, Atlas of (Stevenson), 447; *rev.*, 504.
Porto Rico, Trade of, 390.
Port Said, Trade of, 109, 560, 613.
—— Stanley, Map of, 279.
Portugal, Trade of, 448.
Pourquoi-Pas? dans l'Antarctique, Le (Charcot), 56; *rev.*, 106.
Prince Edward Island, Standard Topographical Map of, *rev.*, 111.
Pritchard, H. Hesketh, Hunting Camps in Wood and Wilderness, *rev.*, 54.
—— —— Through Trackless Labrador, 666.
—— Charles, Papua: A Handbook to its History, 388; *rev.*, 556.
Proceedings of the Royal Scottish Geographical Society, 37, 93, 146, 263, 429, 600, 654.
Pullar, Mr. Laurence, Fellowship conferred on, 146.
Punjab District Gazetteers, 108, 336.
—— States Gazetteer, 108.
Purnea, District Gazetteer of, 613.
Pyramid Passages and Chambers, The Great (Edgar), 56; *rev.*, 332.

Quebec, Topographic Map of, 279.
Queensland, Sketch Map of East Central Queensland Gold, Mineral, and Coal Fields, *rev.*, 112.

Rabot, Charles, on the Tree Limit in Sweden, 481.
Races Congress, First Universal, 208.
Ragg, Lonsdale, Things seen in Venice, 611.
Railway Highways, Origin of, 310.
Raipur District, Central Provinces District Gazetteer, 108.
Rambles with an American (Tearle), *rev.*, 44.
Ramsay, Prof. Sir W., on the Source of Energy, 516.
Ranching, Sport, and Travel (Carson), 667.
Rawling, Capt. C. G., Lecture by, 601.
—— —— on the British Expedition to New Guinea, 527.
Rawnsley, Rev. H. D., By Fell and Dale at the English Lakes, 335; *rev.*, 491.
Reed, J. Howard, F.R.G.S., Cotton-growing within the British Empire, 242.
—— —— Lecture by, 147.
—— —— on India with Respect to the World's Cotton Supply, 531.
Reeder, G., on the Possibility of Climatic Change, 435.
Reid, C., On the Former Connection of the Isle of Wight with the Mainland, 519.
—— —— On the Relation of the present Plant Population of the British Isles, 520.
Reid, R. L., awarded the Cuthbert Peek Fund, 265.
Reinach, Lucien de, Le Laos, 447; *rev.*, 664.
Rendall, M. J., Sinai in Spring, 276; *rev.*, 493.
Rendle, Alfred M., and William Fawcett, Flora of Jamaica, 611.
Renfors, Agnes, Finnish Self-taught (Thimm's System), *rev.*, 274.
Renwick, George, Finland To-Day, 224; *rev.*, 384.
Répin, Dr. Charles, The Distribution and Causation of Goitre, 41.
Réunion, Trade of, 336.
Reval, Foreign Trade and Navigation of Port of, 56.
Reynolds, J. B., Europe and the Mediterranean Region, 334; *rev.*, 489.
Rhine, including the Black Forest and the Vosges: Handbook for Travellers, The (Baedeker), 223; *rev.*, 384.
Rhodesia, Hunting Trips in Northern (Lyell), *rev.*, 47.
—— Museum, Bulawayo, Ethnological Section (Hall), 560.
—— South Africa To-Day, with an account of Modern (Fyfe), 609.
Rhone Country, In the (Kingsley), *rev.*, 156.
Rhys, Ernest, The South Wales Coast, 448.
Rice, Dr. Hamilton, Lecture by, 93.
Ries, Heinrich, Economic Geology, *rev.*, 53.
Riga, Trade of, 667.
Rio de Janeiro, Trade of, 448.
—— São Francisco, Au Brésil, de L'Uruguay au (Walle), *rev.*, 210.
Ripon Falls, Map of, *rev.*, 615.
River and I, The (Neihardt), 55; *rev.*, 163.
Riviera, The (Grieben's Guide Books), 55; *rev.*, 438.
Robertson, Mrs. Margaret K., Fellowship conferred on, 147.
Robinson, E. Van Dyke, Commercial Geography, 56; *rev.*, 501.
Rockies: New and Old Trails, The Canadian (Coleman), 666.
Rocky Mountain Forms, Prof. Mark Jefferson on, 265.
Rocky Mountains, Map of, *rev.*, 111.
Rogers, J. D., A Historical Geography of the British Colonies, 447.
Roma e Dintorni: Guida Speciale, 276; *rev.*, 491.
Roman Frontier Post and its People: The Fort of Newstead in the Parish of Melrose (Curle), 108; *rev.*, 213.
—— Wall in Scotland, The (Macdonald), 275; *rev.*, 382.
Romana Campagna, Carta Topo, 278.
Rome, Trade of, 560.
Ronaldshay, Earl of, An Eastern Miscellany, 275; *rev.*, 438.

Rondet-Saint, Maurice, L'Afrique Equatoriale Française, 667.
Roosevelt, Theodore, African Game Trails, *rev.*, 46.
Rosario, Trade of, 613.
Ross of Mull, The Geology of Colonsay and Oransay with Part of the (Craig, Wright, and Bailey), 612.
Ross-shire and Scotland as seen in the Tain and Balnagown Documents, Old (Macgill), 277.
Rotterdam, Trade of, 390.
Rouen, Trade of, 448.
Roumania, Trade of, 448.
Royal Geographical Society's Awards, 265.
Royal Scottish Geographical Society, Annual Business Meeting, 656.
—— —— —— —— Proceedings of the, **37, 93, 146, 263, 429, 600, 659.**
—— —— —— —— Report of Council, 668.
—— —— —— —— Revision of Laws, 429.
Rudha Hunish, Ordnance Survey of, *rev.*, 109.
Ruling Nations: Considerations on their Characters. By Victor Dingelstedt, 291.
Russia, Carte de Russie d'Europe (Schokalsky), *rev.*, 278.
—— Foreign Commerce of, 667.
—— Undiscovered (Graham), 611.
Russian Year Book (Kennard), 276.
Russier, H., L'Indo-Chine Française, 335; *rev.*, 441.
Ruwenzori, Height of, 518.

Sahara, La Conquête du (Gautier), *rev.*, 161.
St. Helena, Report for, 37, 390.
St. John, R. F. St. A., Burmese Self-Taught, 334.
St. John's, Map of, 279.
St. Louis, Trade of, 448.
St. Lucia, Report for, 224.
Saint-Martin, Vivien de, Atlas Universel de Géographique, *rev.*, 111, 392, 504, 615.
St. Petersburg, Trade of the Consular District of, 667.
St. Vincent, Report on, 168, 560.
Salina Cruz, Trade of, 390.
Salisbury, Prof. R. D., On Purposes of Geographic Instruction, 265.
—— —— On the Teaching of Geography, 100.
—— —— Outlines of Geologic History with Especial Reference to North America, *rev.*, 52.
—— —— Physiography, 168.
Salonica, Trade of, 613.
Salzburg: The Eastern Alps, including the Bavarian Highlands, Tyrol and (Baedeker), 275; *rev.*, 438.
Salvador, Mr., on Distribution of Forest Trees in the Maritime Alps, 148.
Samoa, Trade of, 560.
San Domingo, Report on, 336, 437.
Santa Catharina, Trade of, 667.
San Francisco, Trade of, 390.
Santa Marta, Trade of, 560.
Santal Parganas, District Gazetteer of, 336.
Santos, Foreign Trade of the Port of, 550.
São Francisco a l'Amazone, Au Brésil, Du Rio, 108.
—— Paulo, Trade of, 448.
Saporta, A. de, on the Distribution of the Vine in France, 430.
Saraikela, Bengal District Gazetteers (O'Malley), 108.
Sargasso Sea, Prof. J. J. Stevenson on the, 153.
Savannah, Trade of, 390.
Sayce, Rev. A. H., Meroe, the City of the Ethiopians, 389.
Schaffer, Mary T. S., Old Indian Trails, 610.
Scharfetter, Prof., On the Distribution of Plants and of Man, 39.
Schokalsky, J. de, Carte de Russie d'Europe, *rev.*, 278.
Scholar's Geographical Exercise Book, Johnston's, *rev.*, 605, 616.
Schomburgk, Hans, Wild und Wilde im Herzon Afrikas, 275; *rev.*, 270.
Schottland und seine Bewohner (Suck), 334; *rev.*, 490.
Schulgeographie, Zeitschrift für, 662.
Scientific and Learned Societies of Great Britain and Ireland, The Year-Book of the, 56.
Scilly: The Isles of, Their Story (Mothersole), 55; *rev.*, 156.
Scotland as seen in the Tain and Balnagown Documents, Old Ross-shire and (Macgill), 277.
—— Census of, 390.
—— **1911, Density of Population. By Geo. G. Chisholm, M.A., B.Sc., 466.**
—— Geological Society of, 436.
—— —— Survey of, 110, 278, 391, 503, 614.
—— Historical Wall Maps of (Johnston); *rev.*, 110.
—— Johnston's "Three Miles to Inch" Map of, *rev.*, 391, 503.
—— Ordnance Survey of, 109, 110, 277, 278, 391, 502, 613.
—— Patronage bestowed on Bartholomew's Survey Atlas of, 263.
—— Philip's Contour Outline Map of, *rev.*, 614.
—— Quarter-Inch to Mile Map of (Bartholomew), *rev.*, 503.
—— The Making of (Maxwell), 276; *rev.*, 382.
—— The Roman Wall in (Macdonald), 275; *rev.*, 382.
—— Transactions of the Highland and Agricultural Society of, 336.
—— Twenty-Ninth Annual Report of the Fishery Board for, 390.

Scott, C. A. Dawson, Nooks and Corners of Cornwall, 558.
—— Captain, The British Antarctic Expedition, 38, 263.
—— Sir J. George, Burma: A Handbook of Practical Information, 388.
Scottish Exhibition of Natural History and Industry, Loan of Maps, 147.
Scott-James, R. A., An Englishman in Ireland, 224; *rev.*, 267.
Sea, Appointment of Italian Committee for the Investigation of the, 311.
Sea-level, Capt. E. O. Henrici on Mean, 518.
Seidel, A., Deutsche Grammatik für Japaner, 611.
—— —— Wörterbuch der deutsch-japanischen Umgangssprache, 447.
Seismology, International Association of, 485.
Seistan, Trade of, 613.
Seligmann, C. G., The Veddas, 335; *rev.*, 426.
Semple, Ellen, Influences of Geographic Environment on the Basis of Ratzel's System of Anthropo-Geography, 609.
—— Miss E. C., referred to, 566.
Servia, Finances of, 560.
Seton-Watson, R. W., Corruption and Reform in Hungary, 167; *rev.*, 210.
—— —— The Southern Slav Question and the Habsburg Monarchy, 612.
Seville, Trade and Commerce of, 448.
Seychelles, Report for, 667.
Shackleton, Sir Ernest H., Fellowship conferred on, 147.
—— —— Proposed Expedition to Spitsbergen, 98.
Shahjahanpur, Gazetteer of, 336.
Shanghai, Trade of, 560.
Shans at Home (Milne), 335; *rev.*, 325.
Shantz, H. L., On the Crop Possibilities of the Great American Plains, 484.
Shearer, John E., The Battle of Dunblane, 560.
Shia World: The Glory of the (Sykes), *rev.*, 106.
Shimek, B., Treelessness of the American Prairies, 431.
Shoemaker, Islam Lands, 56; *rev.*, 162.
Shreve, Mr., On the Vegetation of Maryland, 1.
Shrubsole, W. H., Lecture by, 655.
Siberia, Across the Roof of the World: A Record of Sport and Travel through Kashmir, Gilgit, Hunza, the Pamirs, Chinese Turkestan, Mongolia, and (Etherton), 168.
—— Along the Trans-Siberian Railway. Strange (Taft), 389; *rev.*, 496.
—— Projected Railways in, 317.
Sicily, Guide to Italy and (Macmillan), 108.
—— Italy and, Macmillan's Guides, *rev.*, 278.
—— Mediaeval Aspects of Life and Art in the Middle Ages (Wærn), 107; *rev.*, 322.
Sicily, Trade of, 560.
Sierra Leone, Report for, 667.
Sidi-Okba and the Desert (Hyam), *rev.*, 329.
Silesia, Bohemia and the Čechs (Monroe), *rev.*, 157.
Silver Mining and Reduction Processes as Responses to Geographic Conditions, Gold and. By George D. Hubbard, 417, 470.
Sinai in Spring (Rendall), 276; *rev.*, 493.
Sinclair, Francis, Under Western Skies, 611.
Sind, Gazetteer of the Province of (Aitken), 108.
Singhbhum, Bengal District Gazetteers (O'Malley), 108.
Siren Land (Douglas), 223; *rev.*, 322.
Skaggerrak, Tidal Movements in the, 520.
Skeat, Rev. Walter W., The Place-Names of Berkshire, 275; *rev.*, 606.
Skye, The Geology of Glenelg, Lochalsh, and South-East Part of (Peach), 109.
Smith, Bernard, Physical Geography for Schools, 108; *rev.*, 222.
—— H. Sutton, "Yakusu.": The Very Heart of Africa, 558; *rev.*, 608.
—— Prof. J. R., On the Economic Importance of the Plateaux of Tropical America, 432.
Smyrna, Trade of, 56.
Snape, H. J., Europe, 224; *rev.*, 385.
—— —— The British Isles, Geographical Diagrams and Land Forms, with Questions, Statistics, and Tables, 224; *rev.*, 321.
Society Islands, Trade and Commerce of the, 448.
Soda Deposits in East Africa, 100.
Sokota, Map of, 279.
Solomon Islands Protectorate, Handbook of the British, 613.
Somaliland, Carte de la Côte Française des Somalis, *rev.*, 504.
—— Report for, 613.
Spain, Industries and Commerce of, 560.
—— New, The True History of the Conquest of (Diaz), *rev.*, 49.
—— The Magic of (Bell), 610.
—— The Traveller's Handbook for (Calvert), 666.
—— Things seen in (Hartley), *rev.*, 45.
Spanish Possessions in the Gulf of Guinea. Trade, etc., of the, 667.
Spezia, Trade of Port of, 560.
Spitsbergen, Climate of, 485.
—— Dr. H. Wichmann's Exploration of, 99.
—— Mr. G. W. Lamplugh's Proposed Geological Excursion to, 98.
—— Sir Ernest Shackleton's Proposed Expedition to, 98.
—— Some Historical Notes, British Work in. By R. N. Rudmose Brown, D.Sc., 189.

Spitsbergen. Erratum. British Work in, 263.
—— Wireless Telegraphy Station for, 315.
Sport and Travel, Ranching (Carson), 667.
—— Animals and Kindred Subjects, Stray Leaves on Travel (Walter), *rev.*, 222.
—— Echoes of (Murray), *rev.*, 52.
Ssumao, Trade of, 560.
Star Atlas and Telescopic Handbook, A (Norton), *rev.*, 280.
Statesman's Year-Book, The (Keltie), 447; *rev.*, 500.
Statistical Abstract for the United Kingdom in each of the last Fifteen Years, 1896-1910, 612.
Stebbing, E. P., Jungle By-ways in India, *rev.*, 45.
—— —— Stalks in the Himalaya: Jottings of a Sportsman-Naturalist, 610.
Steel, Board of Trade Reports: Iron and, 109.
Stein, S., On the Beet-Sugar Industry, 531.
Steven, T. M., University Medal awarded, 655.
Stevenson, E. L., Atlas of Portolan Charts, 447; *rev.*, 504.
—— Prof. J. J., On the Sargasso Sea, 153.
Stewart, John, Jr., Notes on Changes in the Highland District of Appin on Tayside, 281, 359.
Stockholm, Trade of, 613.
Stout, Hon. Sir Robert, and J. Logan Stout, New Zealand, 610.
Strahorn, C. A., Fifteen Thousand Miles by Stage, 666.
Straits Settlements, Report for, 168.
Structural and Field Geology for Students of Pure and Applied Science (Geikie), 224.
Students, Philip's New Historical Atlas for, *rev.*, 616.
Styria, The Eastern Alps, including (Baedeker), 275; *rev.*, 438.
Suck, Dr. W., Schottland und seine Newohner, 334; *rev.*, 490.
Sudan Almanac, 56.
—— Egypt and Egyptian, Karte von (Saint-Martin), *rev.*, 111.
—— French, Geography in the, 483.
—— From Hausaland to Egypt through the (Kumm), 107; *rev.*, 218.
—— Man and Beast in Eastern Ethiopia, from Observations made in British East Africa, Uganda, and the (Bland-Sutton), 612.
—— On Horseback through Nigeria; or Life and Travel in the Central (Falconer), 666.
—— Tunisia, and Algeria, Islam Lands: Nubia, the (Shoemaker), 56.
Suess, Ed., La Face de la Terre, 447; *rev.*, 502.
Suez, Trade of, 109, 560, 613.
Sugar (Peeps at Industries) (Browne), 612.
Suk: Their Language and Folklore, The (Beech), 559.
Sumatra, and the Other Islands of the Dutch East Indies, Java (Cabaton), 609.
—— Trade of, 390.
Sunbeam, A Saga of the (Hutchinson), 223; *rev.*, 330.
Supan, Dr. Alexander, Grundzüge der Physischen Erdkunde, 609.
Surgeon's Log: Being Impressions of the Far East, The (Abraham), 559; *rev.*, 664.
Sutherland, Geographical Description of the County of. By Alice B. Lennie, M.A., B.Sc., 18, 128, 188.
—— Second Report and Inventory of Monuments and Constructions in the County of, 560.
Svenska Turist-Foreningens Arsskript, 1911, 447.
Swatow, Trade of, 448.
Sweden, Tree Limit in, 481.
Swiss and English Alps, Scrambles in Storm and Sunshine among the (Armour), 167; *rev.*, 383.
—— Mountain Climbs (Abraham), 168; *rev.*, 325.
Switzerland, The Loetschberg Tunnel, 266.
—— Trade of, 109, 448.
Sykes, Major P. M., on Aeronautical Maps, 528.
—— —— The Glory of the Shia World, *rev.*, 106.
Symons Gold Medal awarded to Prof. C. Abbe, 662.
Syria, Guide to Palestine and (Macmillan's), 167; *rev.*, 278.
—— Trade of Coast of, 560.

Taft, Marcus L., Strange Siberia along the Trans-Siberian Railway, 389; *rev.*, 496.
Takaunga, Map of, 279.
Talbot, Frederick A., The Making of a Great Canadian Railway, 666.
Tampico, Trade of, 390.
Tangier, Trade of, 168.
Tansley, A. G., Types of British Vegetation, 612.
Tarr, Prof. R. S., appointed to study the glaciers of Alaska, 314.
Taylor, E. G. R., General and Regional Geography, *rev.*, 331.
—— Griffith, Australia in its Physiographic and Economic Aspects, 168.
Tayside, Notes on Changes in the Highland District of Appin on. By John Stewart, Jr., 281, 359.
Tea Districts, Indian, Taylor's Maps of the Tea Districts, *rev.*, 111.

Tearle, Christian, Rambles with an American, *rev.*, 44.
Telescopic Handbook, A Star Atlas and (Norton), *rev.*, 280.
Teng Yueh, Trade of, 390.
Terre, La Face de la (Suess), 447; *rev.*, 502.
Tessier, Mr. L. F., on Distribution of Forest Trees in the Maritime Alps, 148.
Thayetmyo, District Gazetteer of, 613.
Thessaly, Trade of, 560.
Thorbecke, Mr. F., on The Sub-tropical Climate, 206.
Tibet, Mongolie, Les Derniers Barbares, Chine (D'Ollone), 275; *rev.*, 439.
Tibetan Steppes, Adventure, Sport, and Travel on the (Fergusson), 276; *rev.*, 494.
Tientsen, Trade of, 448.
Tin Fields, Nigeria and its (Calvert), *rev.*, 218.
Tobago, Report for Trinidad and, 168.
Tokyo Imperial University Calendar, The, 108.
Torday, E., Notes Ethno. sur les peuples communément appelés Bakuba, 336.
Torino, Carta Topografica Dintorni di, *rev.*, 391.
—— Pianta Guida, 278.
Townsend, Meredith, Asia and Europe, 611.
Track, Off the Main (Hyatt), *rev.*, 665.
Travel, Ranching, Sport, and (Carson), 667.
—— Sport, Animals, and Kindred Subjects, Stray Leaves on (Walter), 55; *rev.*, 222.
Travellers in Tropical Countries, Hints on Outfit for (Harford), 276.
Travels in Sunny Lands (Maclean), 389; *rev.*, 501.
Trans-Persian Railway, The Proposed. By Lieut.-Col. A. C. Yate, 169.
Travers, R., Letters from Finland, 335; *rev.*, 490.
Trebitsch, Dr. Rudolph, Bei den Eskimos in Westgronland, *rev.*, 221.
Trebizond Vilayet, Trade of, 560.
Tretyakov, Lieut.-General N. A., My Experience at Nan Shan and Port Arthur, 611.
Treves, Sir Frederick, Uganda for a Holiday, *rev.*, 161.
Trinidad and Tobago, Report for, 168.
—— Report on the Surveys of, 613.
Tristan de Cunha, Three Years in (Barrow), *rev.*, 48.
Trivett, John B., The Official Year Book of New South Wales, 667.
Tropical Colonies, Indentured Labour in (Wylie), 560.
Tsetse-Flies, A Handbook of the (Austen), 611.
Tunis, Trade of, 56, 613.
Tunisia and Algeria, Islam Lands: Nubia, the Sudan (Shoemaker), 56.
—— The Mediterranean (Baedeker), 276; *rev.*, 446.
Turkestan, Mongolia and Siberia, Across the Roof of the World: A Record of Sport and Travel through Kashmir, Gilgit, Hunza, the Pamirs, Chinese (Etherton), 168.
—— The Face of Manchuria, Korea, and Russian (Kemp), *rev.*, 160.
—— The Heart of Asia (Curtis), 609.
Turkey and the Turks (Ferriman), 610.
—— General Staff Map, 278.
—— Regilding the Crescent (Aflalo), 108; *rev.*, 323.
Turks, Island Report on, 560.
Turner, Samuel, My Climbing Adventures in Four Continents, 609.
Tyrol, The Eastern Alps, including (Baedeker), 275; *rev.*, 438.
Tyrrell, Mr. J. B., Lecture by, 147.

Uap of the Carolines, The Island of Stone Money (Furness), *rev.*, 51.
Uganda and the Sudan, Man and Beast in Eastern Ethiopia, from Observations made in British East Africa (Bland-Sutton), 612.
—— for a Holiday (Treves), *rev.*, 161.
—— Map of, *rev.*, 615.
—— Report for, 168.
Uist, Its Archæology and Topography with Notes upon the Early History of the Outer Hebrides, North (Beveridge), 612.
Ullapool, Ordnance Survey of, *rev.*, 110.
United Kingdom in each of the last Fifteen Years, 1896-1910, Statistical Abstract for the, 612.
—— —— with Foreign Countries and British Possessions, Annual Statement of the Trade of the, 224, 448, 559.
—— Provinces of Agra and Oudh, District Gazetteers of the, 108.
—— —— of Agra and Oudh, Map of, *rev.*, 615.
—— States, Crop Possibilities of the Great Plains of the, 484.
—— —— General Map of the, 279.
—— —— Geological Atlas, *rev.*, 112.
—— —— Life and Travel in the, Farthest West (Enock), *rev.*, 50.
—— —— Topographic and Geologic Index Map of the, 280.
—— —— Relief Map of the, 279.
—— —— Topographic Survey of the, 280-503.
Universal Races Congress, First, 208.
University Calendar, The Edinburgh, 612.
Unstead, J. F., General and Regional Geography, *rev.*, 331.
—— —— Guide to Geographical Books and Appliances, *rev.*, 43.
Uruguay au Rio São Francisco, Au Brésil, de l' (Walle), *rev.*, 219.

Uruguay, El (Maeso), 448.
—— (Koebel), 389 ; *rev.*, 498.
—— Trade of, 109, 560.

Vassal, Mrs. Gabrielle, A Visit to the Philippines, 57.
Veddas, The, 426.
—— The (Seligmann), 335.
Vegetation der Erde, Die (Engler), 107.
Vegetation of Africa, The, 375.
—— **of Maryland, The, 1.**
—— Types of British (Tansley), 612.
Vegetative Cycles, Dr. H. C. Cowles on the Causes of, 265.
Venezuela and to British Guiana, An Account of Two Ornithological Expeditions to, Our Search for a Wilderness (Beebe), *rev.*, 49.
—— Trade of, 560.
Venice in the Thirteenth and Fourteenth Centuries (Hodgson), *rev.*, 212.
—— Things seen in (Ragg), 611.
—— Trade of, 336.
Vera Cruz, Trade of, 390.
Vernide, R. E., Canada: The Fair Dominion, 389 ; *rev.*, 442.
Victoria, On the Wallaby through (Clowes), 559.
Victorian Year Book (Laughton), 277.
Villiers, J. A. J. de, Lecture by, 601.
Vivette, Down Channel in the (Chatterton), *rev.*, 45.
Volcanic Action, The Nature of (Daly), 560.
Volz, Dr. Walter, Reise durch das Hinterland von Liberia im Winter, 1906-1907, 275.
Vosges: Handbook for Travellers, The Rhine including the Black Forest and the (Baedeker), 223 ; *rev.*, 384.
Vosges, In the Heart of the (Betham-Edwards), 611.

Wærn, Cecilia, Mediæval Sicily, 107 ; *rev.*, 322.
Wales, Bartholomew's "Half-inch to Mile Map" of England and, *rev.*, 614.
—— Coast, The South (Rhys), 448.
—— Prof. Dawkins on the Pre-History of, 601.
Wallace, Dr. A. R., on the Relation of the Present Plant Population of the British Isles, 521.
Walle, Paul, Au Brésil, de L'Uruguay au Rio São Francisco, *rev.*, 219.
Walter, James C., Stray Leaves on Travel, Sport, Animals, and Kindred Subjects, 55 ; *rev.*, 222.
Ward, Herbert, A Voice from the Congo, *rev.*, 47.
—— H. J. B., Mysterious Morocco, *rev.*, 49.
Waterfalls, Constructive. By Prof. J. W. Gregory, F.R.S., D.Sc., 537.
—— Prof. Gregory on Constructive, 520.
Watson, Miss M. A. Hannan, Syllabus of the Geographical Section of the Philosophical Society of Glasgow, 44.
Weald, The Wonderful (Beckett), 559.
Weather Report of the Meteorological Office, Daily, 209.
Weather Science (Henkel), 558.
Weihaiwei, Report for, 448.
—— —— on the Census of, 113.
Western Skies, Under (Sinclair), 611.
West Indies, Report of the Imperial Department of Agriculture in the, 277.
—— The Lands of the (Cross), 610.
Weston, Agnes, My Life among the Bluejackets, 275.
Whitaker's Almanack for 1911, 107 ; *rev.*, 166.
—— Peerage, Baronetage, Knightage, and Companionage for the Year, 107 ; *rev.*, 166.
White, J. A., How to use Contour Handmaps for Class Teaching, 335 ; *rev.*, 558.
—— North: The Great, The Story of Polar Exploration from the Earliest Times to the Discovery of the Pole (Wright), 56.
Who's Who? 1911 (Black), 224.
Whymper, Edward, A Guide to Chamonix and the Range of Mont Blanc, 559 ; *rev.*, 491.
—— —— A Guide to Zermatt and the Matterhorn, 559 ; *rev.*, 491.
Wichmann's Exploration in Spitsbergen, Dr. H., 99.
Wilderness: Our Search for a, An Account of two Ornithological Expeditions to Venezuela and to British Guiana (Beebe), *rev.*, 49.
Wilson, Beckles, Nova Scotia: The Province that has been passed by, 447 ; *rev.*, 556.
Wilson's Equal Scale Map of the World, *rev.*, 615.
—— Folding Globe, *rev.*, 615.
—— Mercator, *rev.*, 615.
Woods, H. C., The Danger Zone of Europe, 276 ; *rev.*, 332.
Workman, W. Hunter, and Fanny Bullock, The Call of the Snowy Hispar, 56 ; *rev.*, 158.
World, Across the Roof of the (Etherton), 168 ; *rev.*, 215.
—— An Elementary Study in Geography, The Nations of the Modern (Mackinder), 167.
—— Bathy-Geographical Map of the (Johnston), *rev.*, 112.
—— The Nations of the Modern (Mackinder), *rev.*, 274.
Wright, Helen S., The Great White North: The Story of Polar Exploration from the Earliest Times to the Discovery of the Pole, 56 ; *rev.*, 221.
Wuchow, Trade of, 560.
Wuku, Trade of, 448.
Wylie, Lieut.-Colonel J. A., Indentured Labour in Tropical Colonies, 560.

Wylie, J. A. R., Rambles in the Black Forest, 558.
Wynaad, Sport on the Nilgiris and (Fletcher), 612.
Wyss, C. Von, Beasts and Birds, A Nature Book for Boys and Girls, 56; *rev.*, 331.

"Yakusu," The Very Heart of Africa (Smith), 558; *rev.*, 608.
Yangtsen, Le, La Grande Artère de la Chine (Dautremer), 276; *rev.*, 440.
Yate, Lieut.-Colonel A. C., The Proposed Trans-Persian Railway, 169.
Yo, Map of, 279.
York, The History of the Castle of (Cooper), 559.
Yorkshire, Nooks and Corners of (Fletcher), 389; *rev.*, 606.
Yoruba, Nigerian Studies: or the Religious and Political System of the (Dennett), *rev.*, 162.
Young, Ernest, A Class-Book of Practical Geography, 610; *rev.*, 662.

Zanzibar, Trade of, 560.
Zermatt and the Matterhorn, A Guide to (Whymper), 559; *rev.*, 491.
Zoogeography, A New Atlas of, 200, 280.
Zoological Society of Scotland, 436.

ILLUSTRATIONS.

Europe.

	PAGE
Cape Wrath,	21
Scourie, a village in a typical gneiss region,	24
Coast near Scourie,	27
Suilven,	28
Ben Arkle and Loch Stack,	29
The River Inver,	31
Group of Laplanders,	79
A Lapp encampment,	81
Torneträsk,	82
Narvik,	83
The Midnight Sun from Fagernæs,	84
Perched blocks on Fagernæs,	85
Trollhätten,	86
The Mound,	129
Lairg,	191
Dornoch Cathedral,	194
The Great Spannort,	405
The Great and Little Mythen and Rote Fluh,	407
The Mythen photographed from a balloon,	408
Salt-grass formation at Lochgoilhead,	453
Flat of Upper Glen Goil,	457
East side of Loch Goil,	459
Allt Lounin with Tom nan Gamhna in the background,	465
Bird's-eye view of the Limmat and the town of Zurich,	567
The Jungfrau and the valley of Lauterbrunnen,	567
The Northern end of the Pentland Hills,	580
Glencorse Reservoir and Castlelaw Hill,	580
The dolerite sill forming the Ferry Hills and Inchgarvie,	587
Volcanic boulder resting on stratified sand and gravel, Comiston,	592
The gorge of the Water of Leith from the Dean Bridge,	592
The Braid Burn excavating its preglacial channel,	592
The ice-deepened valley above Loganlee,	596
The dry valley running through Shewington Farm,	597
The Borthwick dry valley,	598
Borthwick village and the Gore Water,	598
Looking up Glen Sannox,	635
Upper Glen Rosa,	636
Goat Fell from Brodick Bay,	637
The Valley of the White Water,	638
The Valley of the White Water seen from below,	640

Asia.

	PAGE
A ferry-boat in Annan,	58
On the quay at Hongkong,	59
Chinese sampans in a corner of Hongkong Harbour,	60
Filipino women in a caramata in Manila,	62
Igerots with bows and arrows,	66
One of the bridges on the Baguio road,	67
The road from Manila to Baguio,	69
Governor Pack's house on the Baguio Plateau,	70
The wet salt crust of the Kevir,	74
The great tamarisk outside Tebbes,	75
The Baluchistan Desert,	77

AFRICA.

PAGE

Cooking food for the boatmen on the banks of the Benné, . . 229
A hand-plough, ... 233
A curious agricultural implement of the Kirdi, ... 236
Seed-sowing amongst the Kirdi, . 238
Picking cotton at Illushi in Southern Nigeria, . . . 249
Natives bringing in seed-cotton to Marlborough Ginnery, Lagos, . 249
Marlborough Ginnery, Ibadan, . 250

AMERICA.

Transition from Marsh to River Swamp, ... 2
Stream Swamp, ... 3
A Serpentine Barren, ... 4
Sandstone boulders with polypody and mountain laurel, . . 5
A Farmhouse in Western Canada, . 197
A Field of Grain, ... 198
Breaking up the Prairie—the Steam Plough, ... 199

AUSTRALASIA.

New Guinea, North West River, . 342
New Guinea, View from Alkmaar Camp, ... 345
New Guinea, Mountain Papuans, . 352
New Guinea, Wilhelmina Peak (Nov. 8, 1909), . . . 354
New Guinea, Wilhelmina Peak, Orange Mountains, . . . 355
New Guinea, Papuan House near North (Lorentz) River, . . 357

ANTARCTIC.

The *Pourquoi Pas?* aground near Cape Tuxen, ... 118
A living sea-leopard, . . . 118
The Winter Station at Petermann Island, ... 123
On a Glacier in Graham Land, . 122
The landing-party of the Japanese Antarctic Expedition, . . 151

GENERAL.

Homan's Solar Chronometer, . . 92
The Oceanographical Institute at Paris, ... 143
Prof. Portier in his physiological laboratory, ... 144
Prof. Joubin's biological laboratory, 145

PORTRAIT.

FACING PAGE

James Geikie, D.C.L., LL.D., F.R.S., ... 617

MAPS AND DIAGRAMS.

EUROPE.

PAGE

Sketch-Map of Sutherland showing Roads and Means of Communication, ... 131
Schematic section across the Swiss Alpine area, ... 395
Symmetrical folds, ... 396
Asymmetrical folds with inclined axial planes, ... 396
Much compressed asymmetrical folds, ... 396
Contorted folds, ... 397
Stages in the passage of a highly-inclined fold into a reversed or overthrust fault, . . . 397
Faulted recumbent fold, . . . 398
Translated rock-sheets, . . . 398
Sketch-Map of the four great "Rock-groups" of the Alps (after Prof. Steinmann), . . . 400
Section across the Säntis Mountains, ... 403
Schematic Representation of the Evolution of Mountain-structure in the Alps of North Switzerland, ... 404
Schematic Sections of the folded strata of the Glarner Region, . 412
Map of Argoil District, . . . 450
Sketch-Map of Lower Glen Goil, . 452
Map showing Density of Population of Scotland, 1911 Census, . 466

PAGE

Sketch of Neighbourhood of Kerka Falls, Dalmatia, ... 539
Sketch-Map of Neighbourhood of Topolje Falls, ... 540
Plan of Topolje Falls, ... 540
Diagrams illustrating the Topolje Falls, ... 542
Sketch-Map of Neighbourhood of Pliva Falls, Bosnia, . . . 545
Section along the Midlothian basin from South to North, . . 579
Section across the region from West to East, showing the influence of the igneous rocks upon the topography, ... 579
Section showing the Pentland passes, ... 579
Diagrammatic Section showing the relation of the rocks between Currie and the Tyne Water, . 579
Section of the course of the Water of Leith above Colinton, . 593
The Esk near Polton, ... 595
Map showing the Borthwick dry valley, ... 599
Maps showing Topography, Geology, Hydrography, and Distribution of Population, . . 574
Map of the Goat Fell area, . . 634
Section across Glen Rosa, . . 639
Section along the Rosa Water and its tributary the Garth Allt, . 641

PAGE

View looking East from the Bealach an Fhir-bhogha, . . . 642
Sketch-Map showing Mean Annual Rainfall of Edinburgh, . . 645
Diagram showing Influence of Altitude on Mean Temperature, . 647

ASIA.

Map showing New Railway Routes to India, ... 175

AFRICA.

Map showing Dr. Karl Kumm's Route, ... 226
Map showing the Franco-German Congo Agreement. . . . 660

AMERICA.

The Eastern Settlement of Greenland. 629
The Western Settlement of Greenland. 630

AUSTRALASIA.

Map to illustrate the expedition of H. A. Lorentz, LL.D., in Dutch New Guinea, 1907-1909, . . 338
Map of part of Dutch New Guinea, 338

ANTARCTIC.

Map of Dr. Charcot's Route, . . 151

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